DOCUMENT RESUME

ED 428 501 EF 005 055

TITLE	Facilities Management of Existing School Buildings: Two Models.
INSTITUTION	Building Technology, Inc., Silver Spring, MD.; National Science Foundation, Arlington, VA.; Federal Emergency Management Agency, Washington, DC.
PUB DATE	1994-12-00
NOTE	106p.
CONTRACT	BCS-9117732
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Case Studies; *Earthquakes; Educational Facilities; *Educational Facilities Improvement; Elementary Secondary Education; Models; Public Schools; *School Districts; *School Safety
IDENTIFIERS	*Facility Management; Risk Reduction

ABSTRACT

While all school districts are responsible for the management of their existing buildings, they often approach the task in different ways. This document presents two models that offer ways a school district administration, regardless of size, may introduce activities into its ongoing management process that will lead to improvements in earthquake safety for its existing buildings. Model A is intended for districts where facilities planning is mainly reactive, and crisis management is practiced. Model B is for districts where facilities planning is a proactive function within their overall facilities management process. Each model contains the following three parts: a description of the phases and activities making up the facilities management process for existing buildings; a description of the influences which affect specific activities of the facilities management process and the considerations which may be currently involved; and the risk reduction activities incorporated into the facilities management process that contribute to the reduction of risk in the district's inventory of existing buildings. Attachments provide six case studies. (GR)

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ED 428 501

FACILITIES MANAGEMENT OF EXISTING SCHOOL BUILDINGS

TWO MODELS

December, 1994

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Prepared by

BUILDING TECHNOLOGY INC.
1109 SPRING STREET
SILVER SPRING, MARYLAND 20910

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This material is based upon work supported by the National Science Foundation under Grant No. BCS-9117732

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EF 005 055

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PREFACE

In February 1992 the National Science Foundation (NSF) awarded a grant to Building Technology Inc. (BTI) funding a research project titled, *Seismic Mitigation Strategies for Existing School Buildings Which are Subject to Earthquake Risk Throughout the United States*. This document is based on that research. The Co-Principal Investigators were Mr. David B. Hattis, president of BTI, and Dr. Frederick Krimgold of the Virginia Polytechnic Institute and State University. Mr. Melvyn Green, P.E., president of Melvyn Green and Associates, served as a principal consultant. BTI would like to acknowledge the American Association of School Administrators (AASA) and the Council of the Great City Schools for the services and support provided by them.

Participants in the research included the following school districts:

- Blytheville Public Schools (Blytheville, Arkansas)
- School Administrative Unit #8 (Concord, New Hampshire)
- School Administrative Unit #21 (Hampton, New Hampshire)
- Memphis City Schools (Memphis, Tennessee)
- Board of Education of the City of New York (New York, New York)
- Ogden City Schools (Ogden, Utah)
- Portland Public Schools (Portland, Oregon)
- Seattle Public Schools (Seattle, Washington)

On November 11 and 12, 1993 a review panel met to discuss the preliminary findings of the research and advise the BTI team on the development of the information presented herein. Participants in this meeting included representatives from the following school districts and organizations:

- Blytheville Public Schools - Blytheville, Arkansas
- Central Kitsap School District 401 - Silverdale, Washington
- The Council of Educational Facility Planners International
- Division of Risk Management - State of Utah
- Fairbanks - North Star School District - Fairbanks, Alaska
- Federal Emergency Management Agency
- Iron County Schools - Cedar City, Utah
- Memphis City Schools - Memphis, Tennessee
- New York City Board of Education - New York, New York
- Ogden City Schools - Ogden, Utah
- Portland Public Schools - Portland, Oregon
- St. Louis Public Schools - St. Louis, Missouri
- Seattle Public Schools - Seattle, Washington
- School District # 25 - Pocatello, Idaho
- Tucson Unified School District - Tucson, Arizona

Under Federal Emergency Management Agency (FEMA) Contract #EMW-91-C-3636, *Technology Transfer on Seismic Rehabilitation of Existing Buildings*, awarded September 1991, BTI with the assistance of Mr. Green and Dr. Krimgold has enhanced this document for use in workshops and other presentations. Under this contract BTI is responsible for the promotion and conduct of general audience and targeted audience workshops, the development of materials (including lectures, slides, videos, and publications) in support of these workshops, the preparation and delivery of presentations under a speakers bureau, and the distribution of the entire series of FEMA publications regarding the subject of seismic mitigation of existing buildings.

BTI gratefully acknowledges the valuable assistance and cooperation provided by Mr. William A. Anderson, Ph.D., Head, Hazard Mitigation Section, National Science Foundation and Ms. Marilyn MacCabe, Project Officer, Federal Emergency Management Agency.

DISCLAIMER - Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation or Federal Emergency Management Agency.

EXECUTIVE SUMMARY

The following document, Facilities Management of Existing Buildings, consists of two models (MODEL A and MODEL B), which suggest ways that a school district administration, regardless of its size, may introduce activities into its ongoing management process which will lead to improvements in the earthquake safety of its existing building stock. These activities help establish a feasible balance between risk reduction and cost, and could save lives, reduce injuries, and protect property.

All school districts are responsible for the management of their existing buildings. Some approach this task explicitly and formally, while other districts operate on a more informal basis. **MODEL A** is intended for those districts where facilities planning is mainly reactive, and crisis management is practiced. **MODEL B** is intended for those districts where facilities planning is a proactive function within their overall facilities management process.

Each model contains three parts:

THE PROCESS – A simplified description of the phases and activities which make up the facilities management process for existing buildings.

PRESSURES – A general description of the influences which affect the specific activities of the facilities management process and the seismic considerations which may be currently involved.

SEISMIC RISK REDUCTION ACTIVITIES – A description of activities which, when incorporated into the facilities management process, could contribute to the reduction of seismic risk in the district's inventory of existing buildings.

These models do not explicitly reflect all of the different modes of operation of school districts. These differences may be a function of a number of factors such as the district's size, the degree of the board's involvement in its management, or the degree of state funding and involvement.

Several precepts should be kept in mind when applying these models:

DISASTERS AND HAZARDS

EARTHQUAKES are natural disasters. Buildings and their occupants are vulnerable to earthquakes. They are also vulnerable to other **NATURAL DISASTERS**----hurricanes, storms, floods, etc., and to other **HAZARDS**----asbestos, radon, lead paint, etc. These models address vulnerability to earthquakes. However the chance of success in the implementation of their recommendations will be greater if it is part of a comprehensive approach to building safety and **MULTI-HAZARD MITIGATION**.

MITIGATION CRITERIA

The recommendations in these models primarily address the **LIFE SAFETY** of building occupants. Following them relates directly to the responsibility of school districts, and the potential **LIABILITY** of districts for loss or injury suffered by their pupils and employees. However, school districts may apply other progressively stricter criteria----**BUILDING DAMAGE CONTROL** or **CONTINUITY OF USE**----in approaching the reduction of their earthquake vulnerability. A similar approach to facilities management can be used to meet each of these levels of mitigation criteria.

MITIGATION MEASURES

The mitigation measures recommended in the models, while concentrating on buildings, fall into four related categories: **CURRICULUM**----raising pupil and teacher awareness and understanding of earthquakes. **DRILLS**----raising occupants' awareness of earthquake hazards and preparing for them. **BUILDING CONTENTS**----reducing risks from earthquake damage to equipment, furnishing, and unsecured objects in buildings. **BUILDINGS**----reducing risks from earthquake damage to parts of buildings and from building collapse.

FACILITIES MANAGEMENT
OF
EXISTING SCHOOL BUILDINGS

MODEL A
REACTIVE FACILITIES PLANNING

December, 1994

Prepared by

BUILDING TECHNOLOGY INC.
1109 SPRING STREET
SILVER SPRING, MARYLAND 20910

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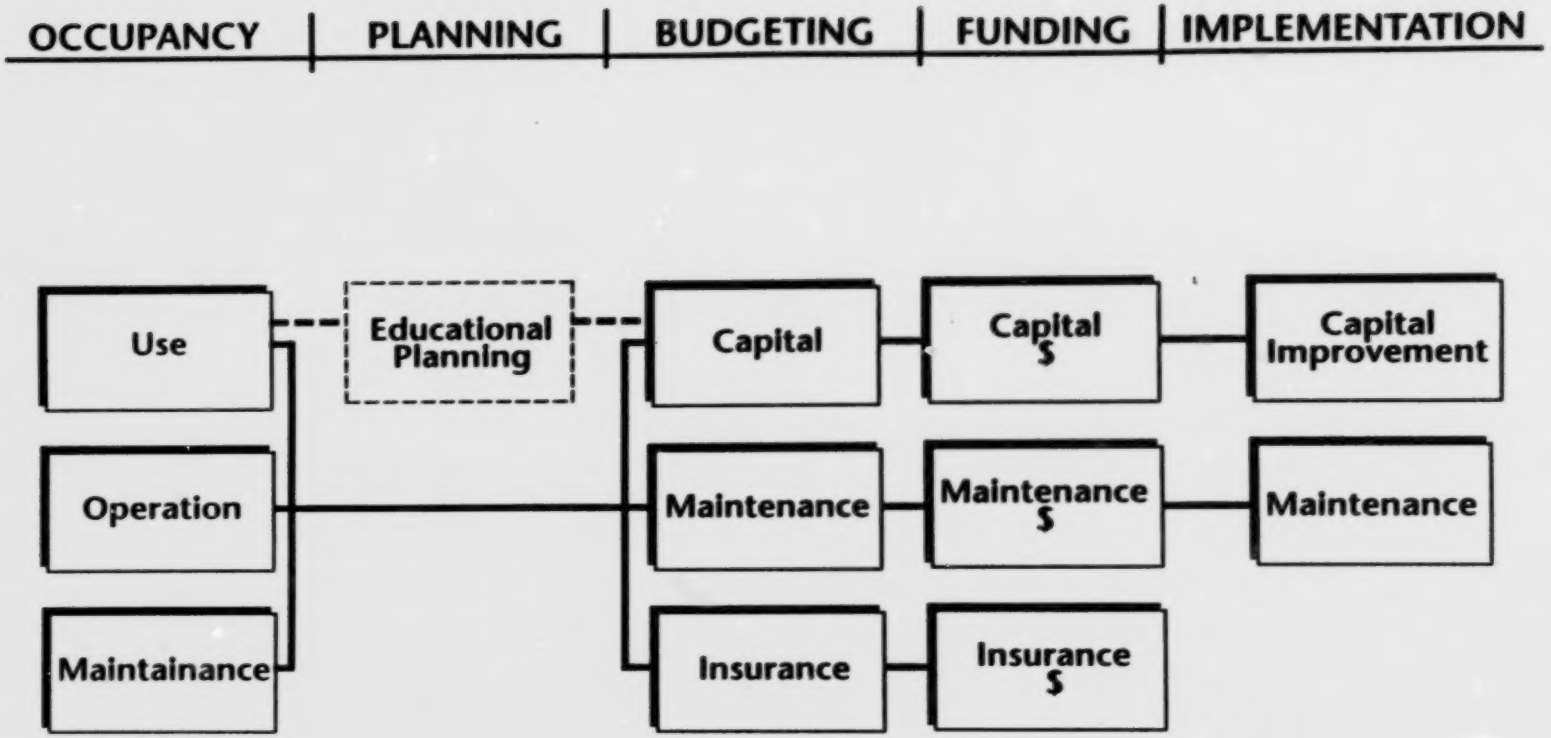
I. THE FACILITIES MANAGEMENT PROCESS

PHASES AND ACTIVITIES

The facilities management process for existing buildings can be viewed as consisting of five phases of activities:

- occupancy
- planning
- budgeting
- funding
- implementation

The facilities management process is generic, and while local variations occur, it is generally followed, explicitly or implicitly by most school districts. In some cases the planning and budgeting phases are combined, while in other cases there is a distinct educational planning phase. Each phase and activity is briefly discussed below.



The Process – Phases and Activities

A – REACTIVE FACILITIES PLANNING

OCCUPANCY

The occupancy phase includes three basic activities:

- Use
- Operation
- Maintenance

Use

This activity consists of all the functions that the facility is intended to shelter and to support. In the case of school facilities these include educational, support and ancillary functions. The educational functions are determined by educational philosophy, demographics, sociological and anthropological factors, civil rights, resources, etc. Support functions include administration and management. Ancillary functions include recreational program and community activities.

These functions are carried out in each facility under the authority of the principal by the teachers, the students or the principal.

Operation

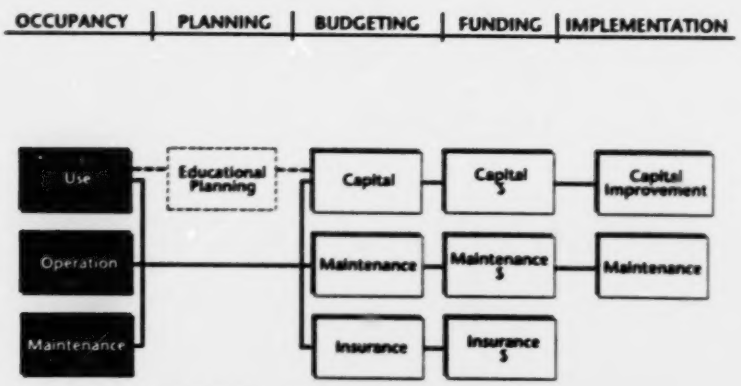
Facilities operation consists of all the activities and functions which the facility and its components must perform in order to support the use. Examples are the mechanical functions (heating, cooling, ventilation), electrical functions (lighting, communications, alarm) and plumbing functions.

Operation functions may be carried out by custodial staff of the district or the facility and/or by contractors.

Maintenance

Maintenance includes all the activities required to enable the use and operation of the building to be carried out continuously over a period of time. They can be broken down into custodial maintenance, routine maintenance and repair.

Maintenance functions may be carried out by custodial staff of the district or the facility and/or by contractors.



PROCESS – PHASES AND ACTIVITIES

PLANNING

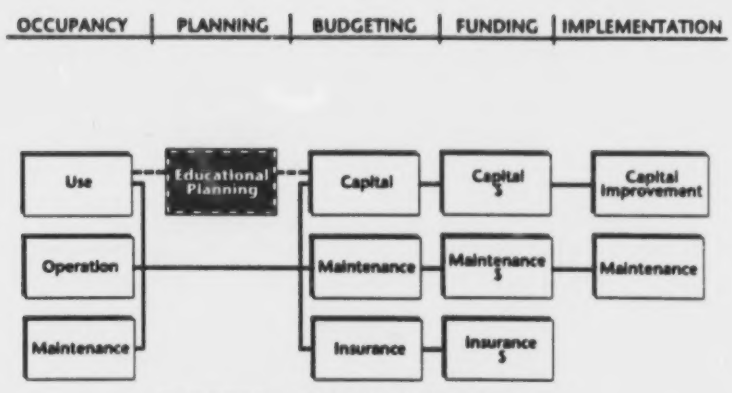
The planning phase consists of the projection and forecasting of future needs, which may be governed by policies adopted by the Board, and in some cases, by state requirements. Educational planning can be carried out periodically or continuously, and can vary as to the time period covered by the projections and forecasts. Planning functions may be carried out by the school district administration, with or without the assistance of consultants.

In some districts the planning and budgeting phases are combined, with planning not being a distinct or particularly robust activity.

In some districts there is a formalized educational planning phase which provides input into the budgeting phase. Educational planning attempts to formulate future educational programs and their support needs by analyzing and forecasting several factors such as:

- demographics (population growth or decline, neighborhood shifts, etc.)
- educational philosophy, including special education, adult education, etc.
- educational technology (computers, telecommunication, video-communication, etc).
- cultural and sociological factors
- federal and state mandates
- equity and civil rights

Absent a proactive strategic facilities planning activity, the support for future educational programs imposes facility requirements defined by parameters such as numbers of classrooms, central facilities, and square footage. This provides input into the definitions of overall capital improvement needs, but is not detailed enough to be considered as formal facilities planning (MODEL B).



PROCESS – PHASES AND ACTIVITIES

BUDGETING

The budgeting phase consists of the projection of future financial resources required to meet future needs. It is carried out annually (covering a period of one or more years) by the school district administration (superintendent, business manager) and the board. There are three elements of the budget which are relevant to the discussion of facilities management:

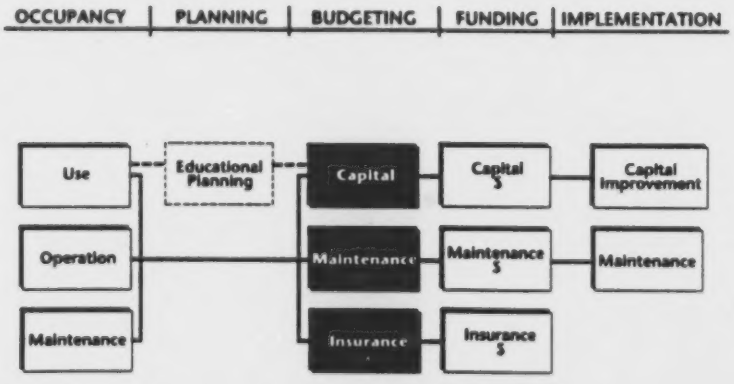
- capital
- maintenance
- insurance

Capital budgets generally relate to the acquisition of buildings and major systems, the occurrence of which is not annual or repetitive, and which can therefore be amortized.

Maintenance budgets generally relate to recurring annual expenditures, and address existing inventories of buildings and systems without adding to the inventories. However, the distinction between capital and maintenance budgets varies from one school district to the next. At one extreme is a total separation, mandated by law, labor jurisdiction or other factors. At the other extreme is a rather unclear separation between the two. Maintenance budgets are often part of the operations budgets, or general fund budget, with maintenance funds often reportedly being used to cover shortfalls in operations. (The latter practice has reportedly contributed to the growth of deferred maintenance in many school districts.)

Insurance budgets may be used in different ways, including the purchase of insurance, contributions into a regional or statewide risk and insurance pool, and the funding of a self-insurance reserve. Of relevance to facilities management are property and general liability insurance.

In districts where formalized planning is not practiced, budgets are developed annually in response to internal pressures from the use phase. Facility decisions are usually direct responses to these pressures, with little or no forecasting.



PROCESS – PHASES AND ACTIVITIES

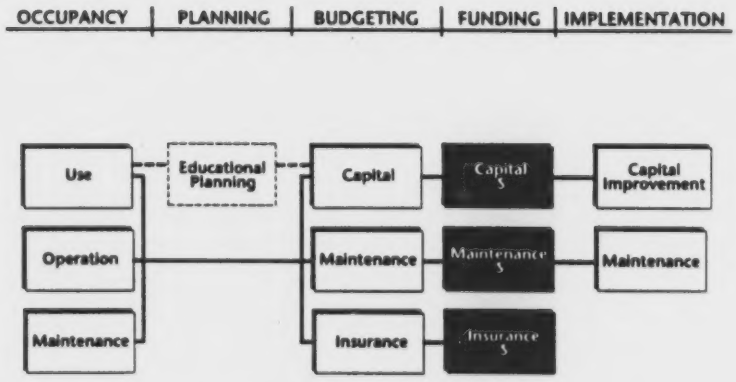
FUNDING

The funding phase consists of those activities required to obtain the financial resources to meet the budgets. The funding of school budgets in general, and of the three budget elements noted above (capital, maintenance, insurance), varies from district to district.

There is great variation among states as to the extent of state contribution to local school budgets. Some states limit their contribution to capital budgets and others to a general fund. States may use different formulas for the allocation of resources to school districts in order to achieve equalization.

School districts can fund their budgets by various combinations of taxation and debt, both of which are in some cases controlled or limited by state constitutions or by periodic voter initiatives. Different school budgets may be subject to varying requirements of approval of taxation and/or debt by the electorate. At one extreme, school boards are authorized to issue bonds without additional approval. At the other extreme, there are districts where local school budgets must be voted at town meetings.

There are many local variations in funding where school districts, municipalities and counties have overlapping jurisdictions.



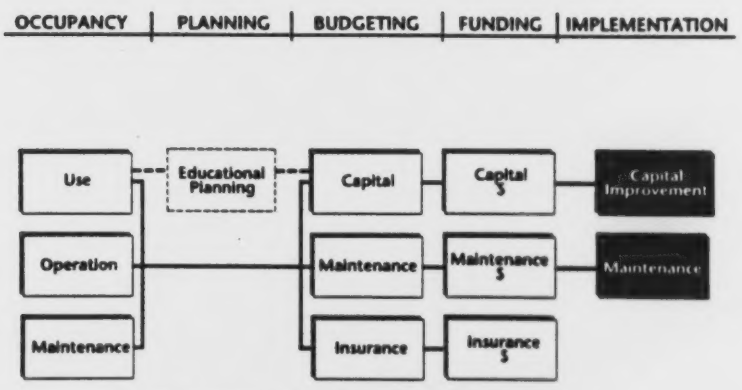
PROCESS – PHASES AND ACTIVITIES

IMPLEMENTATION

The implementation phase includes design and construction, and can be broken down into three categories of projects, of which the latter two are relevant to existing buildings:

- acquisition projects
- capital improvement projects
- maintenance projects

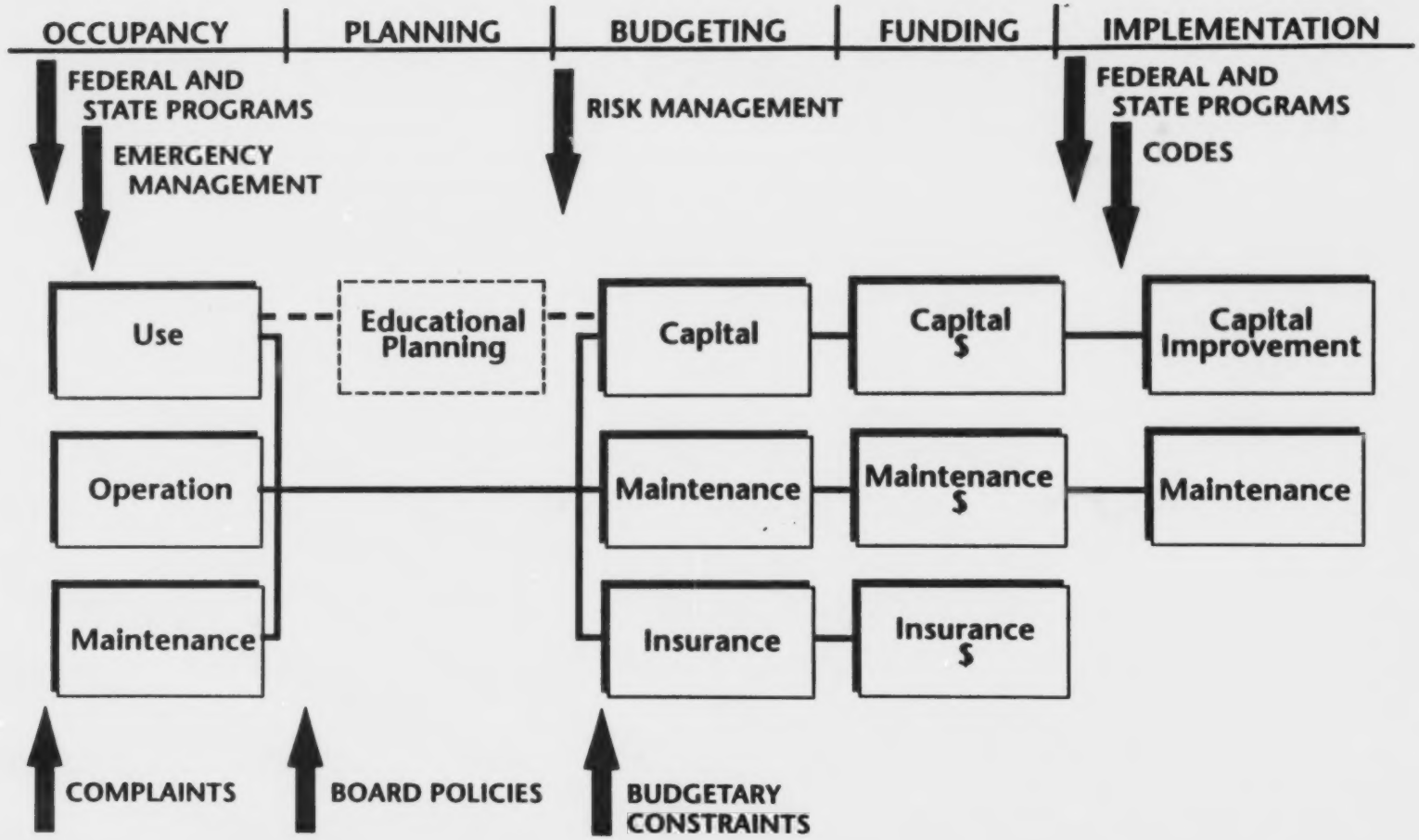
Capital improvement and maintenance projects are managed by district staff and carried out by district staff and by contractors. The management of these two categories may be separated or combined, depending on issues of labor jurisdiction and legal authority.



PROCESS – PHASES AND ACTIVITIES

II. PRESSURES ON THE FACILITIES MANAGEMENT PROCESS AND RELATED SEISMIC CONSIDERATIONS

The forces, or pressures, which influence the facilities management process can be thought of as INTERNAL----those generated from within the school district and its administration, and EXTERNAL----those imposed on school districts by outside entities. Both internal and external pressures can be or can become the sources for seismic considerations influencing facilities management decisions.



External (↓) and Internal (↑) Pressures

A-11

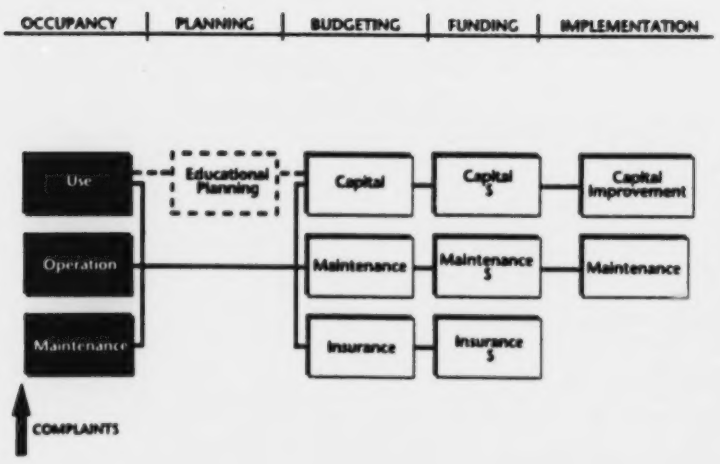
A – REACTIVE FACILITIES PLANNING

Absent a proactive strategic facilities planning activity (MODEL B), internal pressures are:

- complaints generated in the occupancy phase,
- policies adopted by the Board, and
- budgetary constraints.

Complaints Generated in the Occupancy Phase - In the context of reactive facilities management, complaints form the basis for what has been called the "squeaky wheel" approach to facilities management.

Seismic Considerations - There are examples where the occurrence of school damage in an earthquake (e.g., 1949 Seattle) led to seismic retrofit activities. This may occur again as a result of the school damage experienced in the recent moderate Northwest Oregon earthquake (March 25, 1993). When school occupants (and parents of the student body) become informed of the potential seismic hazards, they may provide the pressure leading to seismic retrofits ("the squeaky wheel").



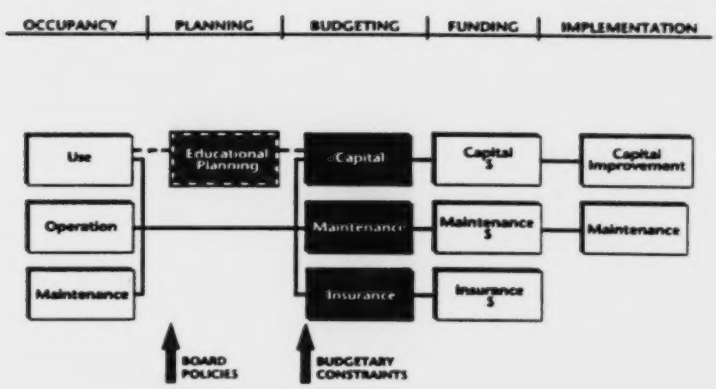
PRESSURES AND SEISMIC CONSIDERATIONS

Policies Adopted by the Board - School Boards may, from time to time, adopt written policies on issues of political and social significance. These policies guide the actions of the district administration.

Seismic Considerations - School Boards may adopt policies addressing seismic issues.

Budgetary Constraints - Political and economic conditions in many parts of the country have placed severe limitations on school budgets. This problem is often exacerbated by a variety of unfunded mandates imposed on school districts by the federal and state governments (external pressures).

Seismic Considerations - The strategy of integrating incremental seismic retrofit with other work, which is an integral part of this facilities management model, can provide a method for addressing seismic risk reduction within budget constraints.

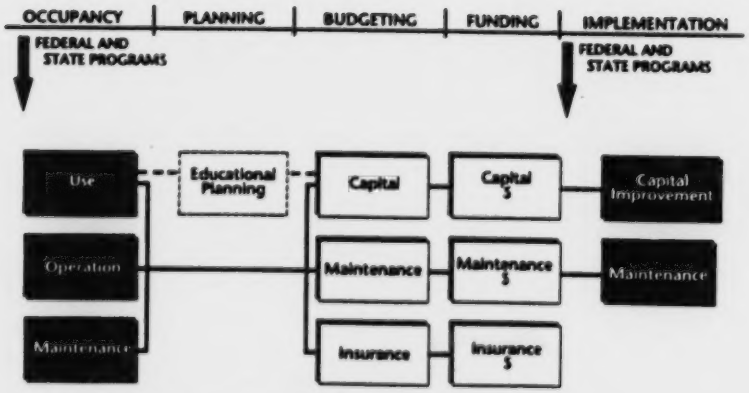


PRESSURES AND SEISMIC CONSIDERATIONS

A-13

Federal and State Mandates and Programs - Federal and state programs may establish requirements affecting the occupancy and implementation phases which have facilities implications (e.g., ADA and OSHA requirements). Usually these requirements address issues of health and safety. They impose costs on school districts, and while sometimes they are accompanied by funding, often they are not. Additionally, governmental funding programs may entail facilities requirements in participating school districts (e.g., energy conservation).

Seismic Considerations - Seismic retrofit mandates for schools have existed in California since the 1930s. Other Federal and state programs that have facilities implications (e.g., improved access and safety, energy conservation and technology improvements) provide opportunities for integrating incremental seismic retrofit, which is an integral part of this facilities management model.



PRESSURES AND SEISMIC CONSIDERATIONS

Codes and Code Enforcement - Building codes rarely include requirements on the occupancy phase of buildings, that is, on use, operation or maintenance. There may be other ordinances such as fire codes, that do impose such requirements. However, building codes do contain requirements on the implementation phase, in cases of repair, renovation or addition to existing buildings. These requirements may be enforced by a state or local agency, or there may be a requirement that school district staff be responsible for the enforcement (for example, in the state of Utah).

Seismic Considerations - State and local building codes may impose seismic retrofit requirements on existing buildings. Recent examples include codes or statutes passed in Utah [1], Massachusetts [2], Arkansas [3] and Missouri. [4]

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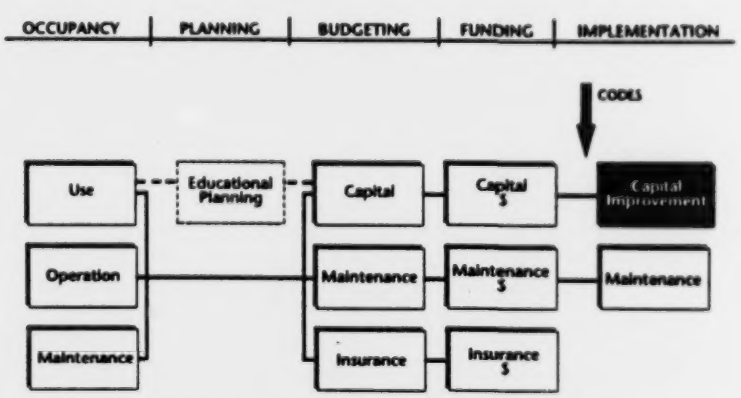
1 **R156-56-20 Amendments to the UBC**
[Statewide amendments to the Uniform Building Code]

2 **Proposed Revisions to Massachusetts State Building Code: Structural Provisions for Existing Buildings**
[September 17, 1992]

3 **Act 1100 1991: An Act to Safeguard Life, Health and Property by Requiring Earthquake Resistant Design for All Public Structures to be Constructed or Remodeled Within the Boundaries of this State Beginning September 1991.**

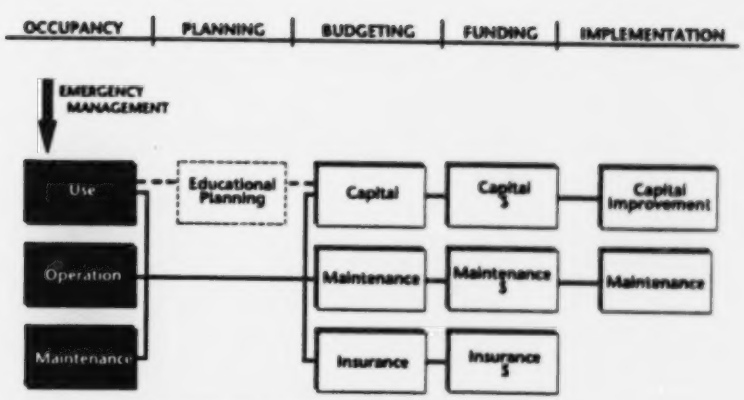
4 **Revised Statutes of Missouri 1992: Earthquakes - Seismic Building and Construction Ordinances 319.200**



PRESSURES AND SEISMIC CONSIDERATIONS

Emergency Management - State or local emergency management agencies may assign specific roles that school buildings must perform in case of natural disasters, including earthquakes. This may affect the occupancy phase by requiring periodic exercises involving building occupants.

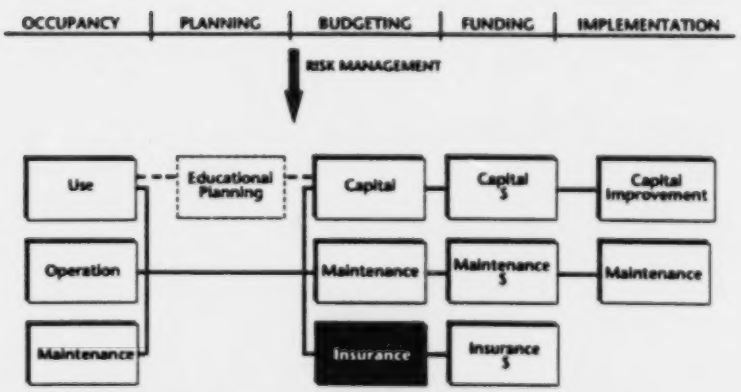
Seismic Considerations - Emergency management plans related to the role of school facilities in a disaster may be general and broad, or detailed and specific. In some cases, specific schools are assigned specific functions they are to perform in the post-disaster environment, such as emergency shelter, feeding and disaster assistance. Portland, Oregon's emergency response plan is an example of such specific planning. (See Attachment A for excerpt from Portland Case Study, dated April 8, 1994.) In such cases a legitimate question is "In what condition will the building be following an earthquake?"



PRESSURES AND SEISMIC CONSIDERATIONS

Risk and Insurance Management - State and/or local school district risk and insurance management may have a direct or indirect role in the budget phase of the process, as regards the decisions related to insurance. These decisions include self insurance (i.e., taking the losses), purchasing insurance, and taking loss reduction measures (i.e., mitigation).

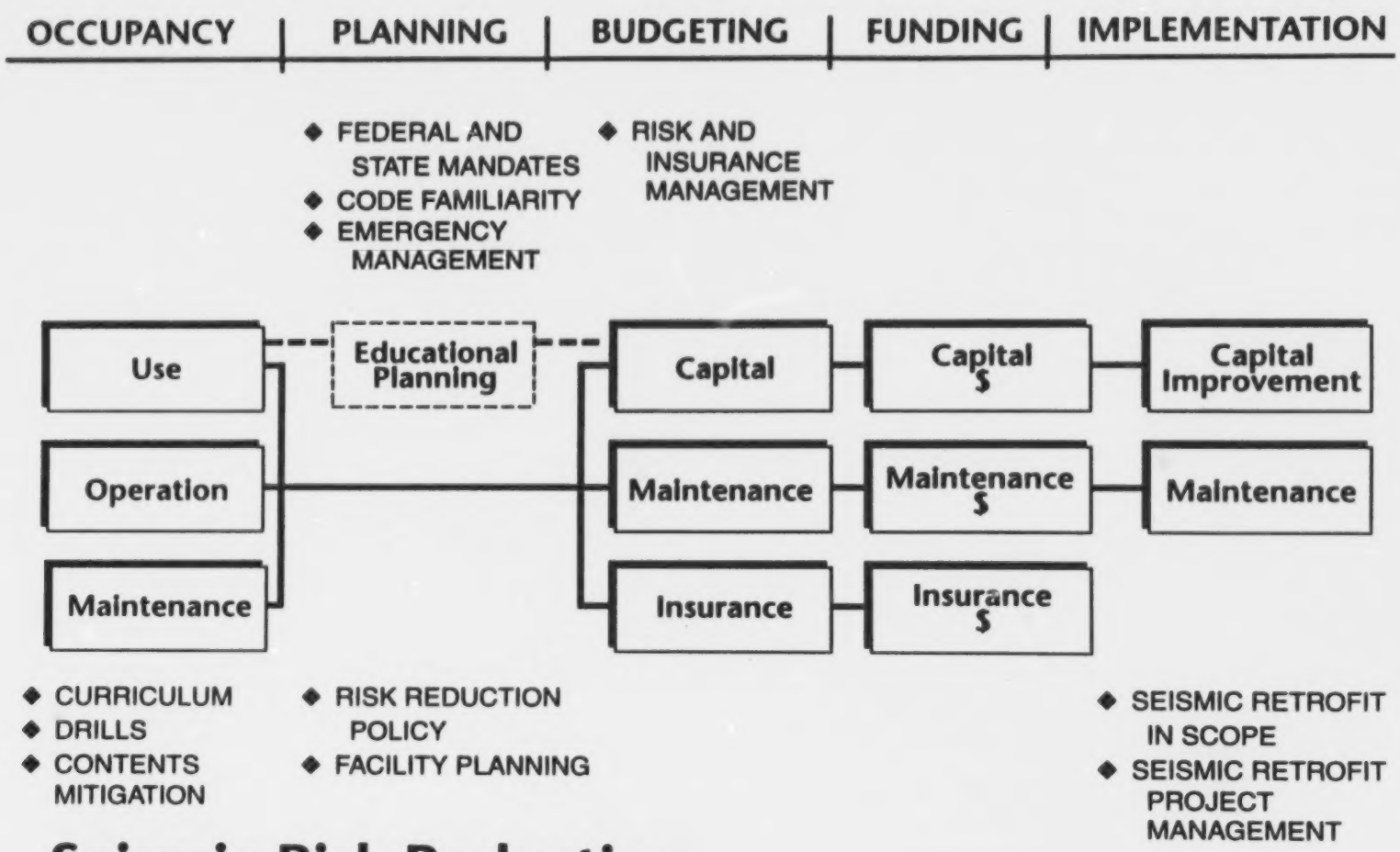
Seismic Considerations - In areas of seismic risk the risk of building loss or damage, the risk of occupant deaths or injuries, and the risk of school district liability must all be assessed. The decision of whether or not to seek earthquake property and casualty insurance coverage and general liability coverage must be made. Insurance companies which offer such coverage may offer incentives to customers who undertake loss reduction measures in the form of seismic retrofit.



PRESSURES AND SEISMIC CONSIDERATIONS

III. SEISMIC RISK REDUCTION ACTIVITIES

Consider adding the following activities to the current facilities management process. They will contribute to the reduction of seismic risk in a district's existing building inventory. These activities relate to the internal and the external pressures influencing the process.

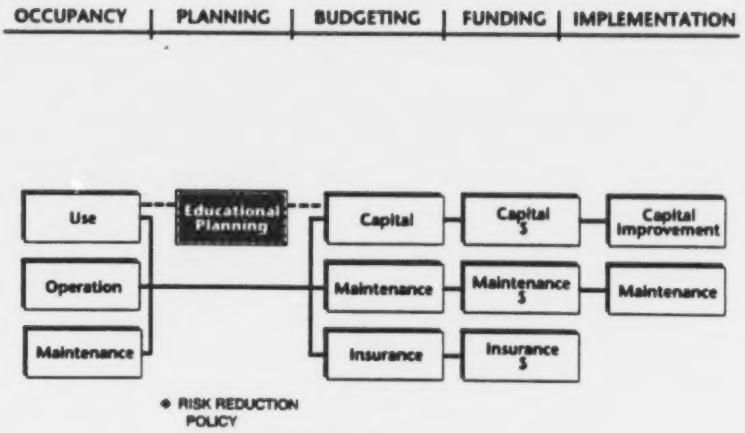


Seismic Risk Reduction

A – REACTIVE FACILITIES PLANNING

A.1 Risk Reduction Policy

Get the Board to adopt a policy statement on seismic risk reduction.



SEISMIC RISK REDUCTION

A.2 Earthquake Curriculum

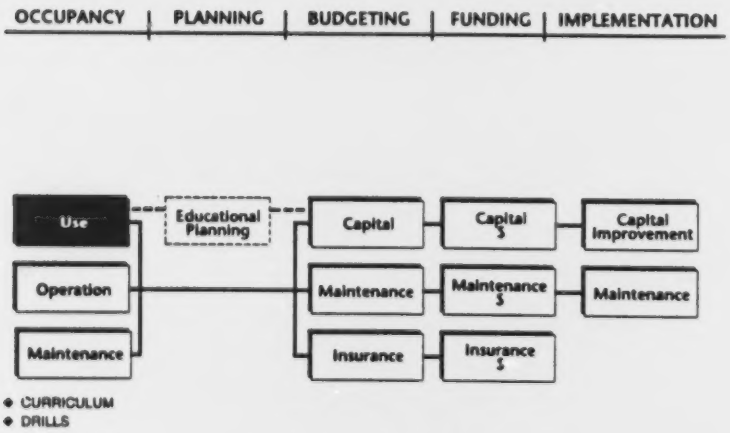
Introduce balanced awareness of seismic risk within the school population (students, teachers, parents) by introducing the subject into the curriculum. Provide timely and appropriate information such as the experience of school facility performance in recent earthquakes.

See FEMA 159, EARTHQUAKES - A Teacher's Package for K-6 Grades. (See Attachment B for a short description and ordering instructions for this and other related publications.)

A.3 Drills

Introduce earthquake drills and appropriate earthquake preparedness materials into the regular school program.

See FEMA 88, Guidebook for Developing a School Earthquake Safety Program, and FEMA 88a, Earthquake Safety Activities for Children. (See Attachment B for a short description and ordering instructions for this and other related publications.)



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A.4 Building Contents Mitigation

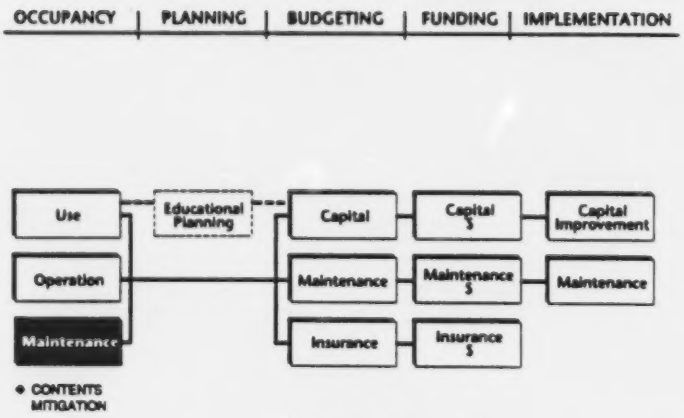
Implement measures to reduce or eliminate risks from earthquake damage to equipment, furnishings, and unsecured objects in buildings, as part of routine or preventive maintenance.

Work may include such items as:

- bracing ceiling panels and fixtures,
- anchoring of water heaters and piping,
- fastening desktop equipment,
- anchoring bookcases and storage shelves,
- restraint of objects on shelves, and
- addition of automatic gas shutoffs.

See FEMA 241, Nonstructural Earthquake Hazards in Schools. (See Attachment B for a short description and ordering instructions for this and other related publications.)

Similar documents have been published by the states of California (Identification and Reduction of Nonstructural Earthquake Hazards in California Schools, Bay Area Regional Earthquake Preparedness Project and Office of the State Architect, February 1990) and Washington (Non-Structural Earthquake Hazards Manual, Superintendent of Public Instruction, July, 1989).



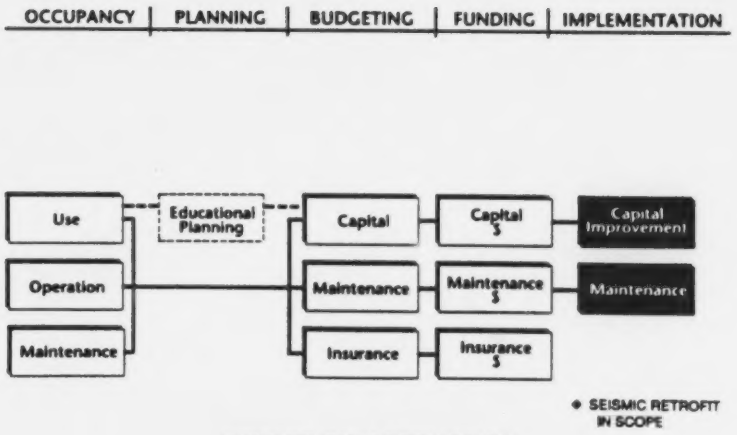
A.5 Seismic Retrofit in Scopes of Work

When implementing capital improvement and/or maintenance projects, identify related incremental seismic retrofit measures using Incremental Seismic Retrofit Opportunities as a reference. Add these seismic retrofit measures to the project specification.

Work classifications may differ from district to district, but will fall into one or more of the following categories:

- Additions to existing buildings
- Renovations of existing buildings
- Building systems replacements
- Building systems repairs

When adding seismic retrofit to other work, attention should be paid to keeping the bid packages simple.



SEISMIC RISK REDUCTION

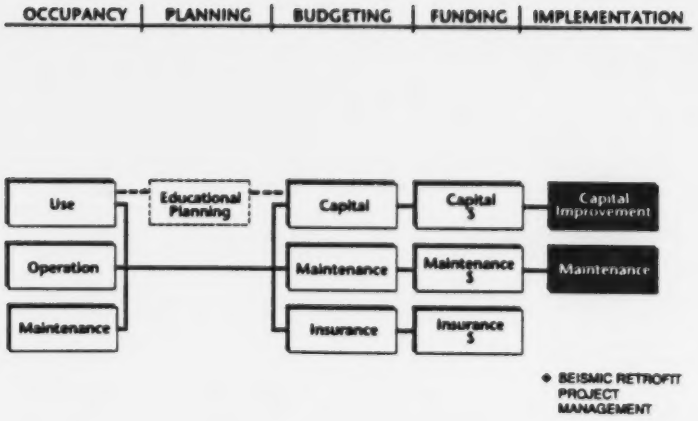
A.6 Seismic Retrofit Project Management

The implementation of the incremental seismic retrofit measures in combination with other building work may require detailed project design and bid-packaging.

- **Consider designating a Project Manager familiar with the rationale of incremental seismic retrofit, as the District's representative on the project team.**

- **Present the rationale behind the retrofit measures to the professionals (in-house or consultant architects/engineers) responsible for preparing the bid documents for projects which include incremental seismic retrofit work. This is necessary to assure that the risk reduction objectives are actually achieved.**

- **Conduct a pre-bid conference to fully explain the seismic risk reduction objectives to all prospective bidders.**

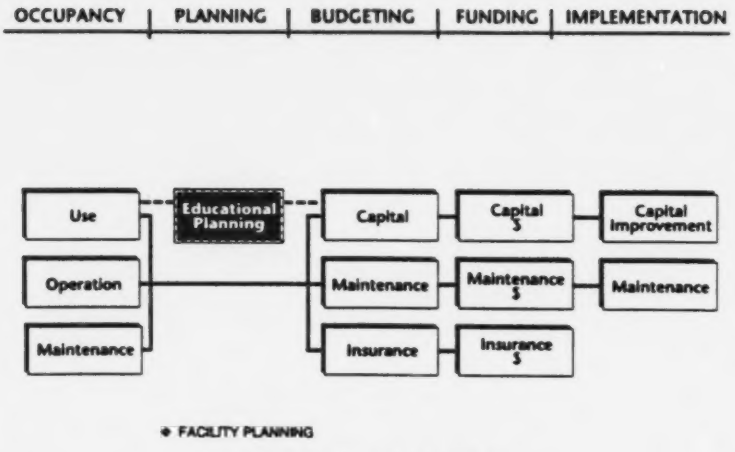


A.7 Proactive Facilities Planning

Consider introducing proactive strategic facilities planning as a formalized activity of the facility management process and move to MODEL B.

Some of the advantages of proactive facilities planning are:

- a more rational approach to budgeting (near and long term),
- the implementation of capital investments in accordance with previously established priorities,
- a locus for funneling all the internal and external pressures that affect facilities into a single, balanced plan, and
- an opportunity to coordinate with other related activities such as risk management and emergency management.

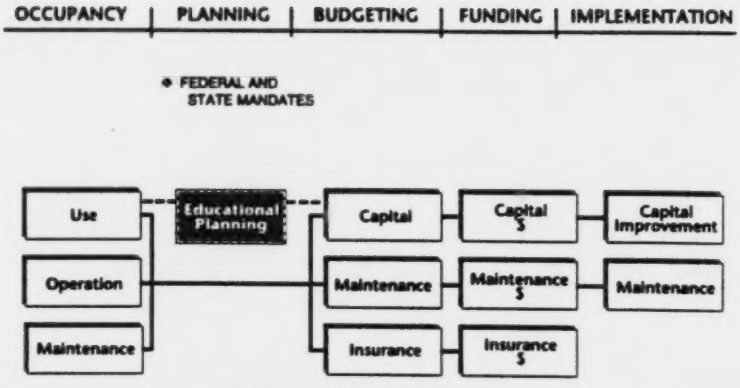


A.8 Federal and State Mandates and Programs

Become familiar with the seismic retrofit requirements, currently imposed by federal and state programs, or under consideration for the future.

In the case of small and medium school districts this might best be accomplished by means of a service provided by a Regional Educational Service Agency, by a state agency, or an applicable trade association.

In the case of large districts this may be accomplished by assigning a "seismic regulations watch" to an individual in the facilities department.



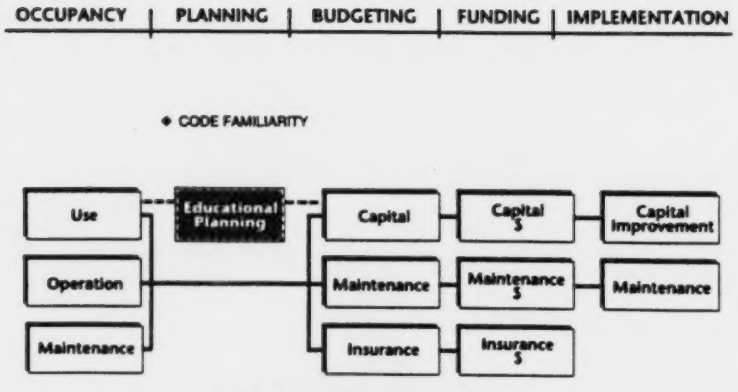
SEISMIC RISK REDUCTION

A.9 Codes and Code Enforcement

Become familiar with the seismic retrofit requirements of building codes, and other codes and ordinances, either currently imposed or under consideration for the future.

In the case of small and medium school districts this might best be accomplished by means of a service provided by a Regional Educational Service Agency, by a state agency, or an applicable trade association.

In the case of large districts this may be accomplished by assigning a "seismic codes watch" to an individual in the facilities department, or by assigning seismic responsibility to a general code monitoring activity if one already exists.



SEISMIC RISK REDUCTION

A.10 Emergency Management

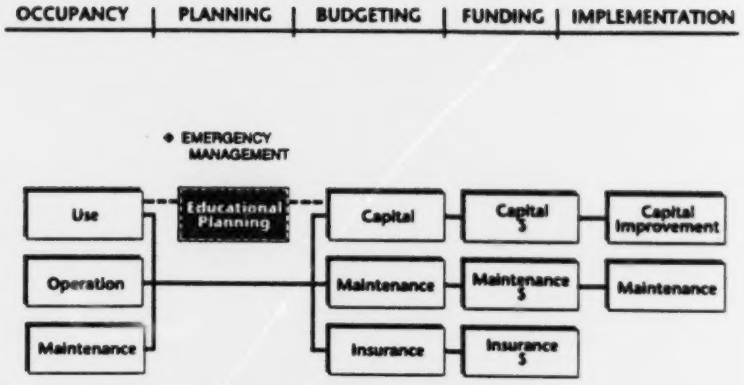
- **Establish liaison with emergency management agencies and volunteer agencies (e.g., the Red Cross).**

- **Become familiar with the post-disaster role of schools in the local emergency response plans.**

  Get the post-disaster role defined in as specific and detailed a way as possible, assigning specific functions to specific facilities. Then ask the emergency planning team the question of what condition those specific facilities are likely to be in following an earthquake, and simulate that condition in subsequent exercises.

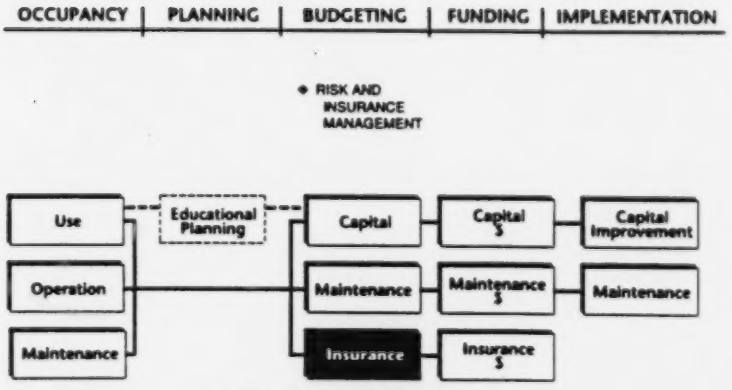
- **Determine the impact of the post-disaster role on seismic retrofit priorities.**

- **Become active in the emergency planning process.**



A.11 Risk and Insurance Management

- **Assess the earthquake risk and vulnerability of all facilities.**
- **Evaluate the need for earthquake property and casualty insurance, as well as liability coverage**
- **Evaluate the impact of loss reduction measures.**
- **Determine the availability of incentives for seismic retrofit actions from the insurance carrier.**



SEISMIC RISK REDUCTION

FACILITIES MANAGEMENT
OF
EXISTING BUILDINGS

MODEL B
PROACTIVE FACILITIES PLANNING

December, 1994

Prepared by

BUILDING TECHNOLOGY INC.
1109 SPRING STREET
SILVER SPRING, MARYLAND 20910

This material is based upon work supported by the National Science Foundation under Grant No. BCS-9117732

Workshops and workshop distribution of this document are under Contract EMW-91-3636 with the Federal Emergency Management Agency

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I. THE FACILITIES MANAGEMENT PROCESS

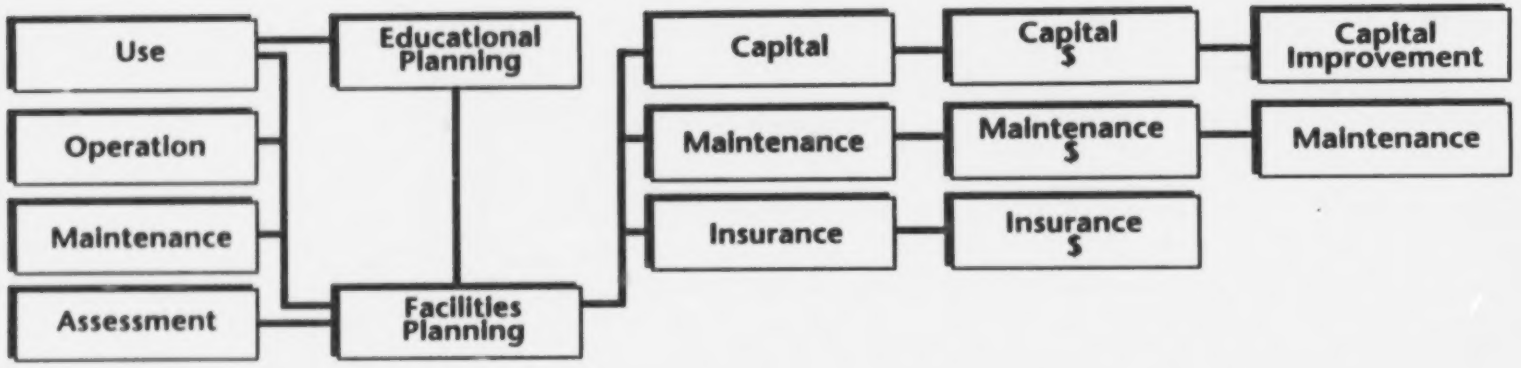
PHASES AND ACTIVITIES

The facilities management process for existing buildings can be viewed as consisting of five phases of activities:

- occupancy
- planning
- budgeting
- funding
- implementation

The facilities management process is generic, and while local variations occur, it is generally followed, explicitly or implicitly by most school districts. Each phase and activity is briefly discussed below.

OCCUPANCY | PLANNING | BUDGETING | FUNDING | IMPLEMENTATION



The Process – Phases and Activities

B – PROACTIVE FACILITIES PLANNING

B-3

OCCUPANCY

The occupancy phase includes four basic activities:

- Use
- Operation
- Maintenance
- Facilities Assessment

Use

This activity consists of all the functions that the facility is intended to shelter and to support. In the case of school facilities these include educational, support and ancillary functions. The educational functions are determined by educational philosophy, demographics, sociological and anthropological factors, civil rights, resources, etc. Support functions include administration and management. Ancillary functions include recreational program and community activities.

These functions are carried out in each facility under the authority of the principal by the teachers, the students or the principal,

Operation

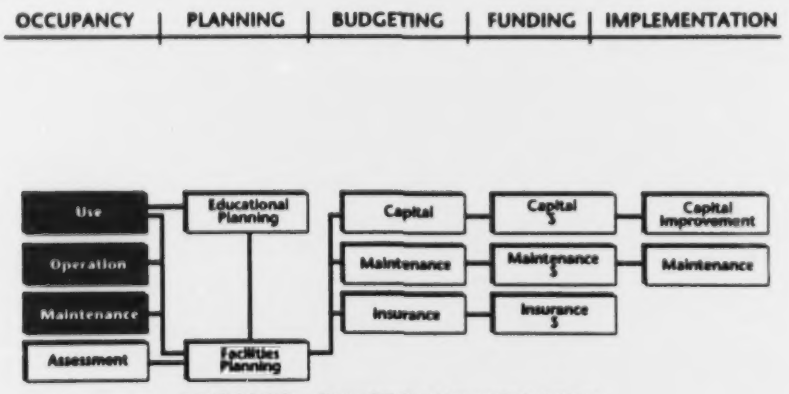
Facilities operation consists of all the activities and functions which the facility and its components must perform in order to support the use. Examples are the mechanical functions (heating, cooling, ventilation), electrical functions (lighting, communications, alarm) and plumbing functions.

Operation functions may be carried out by custodial staff of the district or the facility and/or by contractors.

Maintenance

Maintenance includes all the activities required to enable the use and operation of the building to be carried out continuously over a period of time. They can be broken down into custodial maintenance, routine maintenance and repair.

Maintenance functions may be carried out by custodial staff of the district or the facility and/or by contractors.



PROCESS – PHASES AND ACTIVITIES

Facilities Assessment

This activity consists of the survey or inspection of the school facilities on a scheduled basis. It may also include a review of documents, such as archival building plans, for the purpose of retrieving specific information. The purpose(s) of the surveys or inspections is to determine the facilities' condition and develop a database in relation to one or more of the following categories of need:

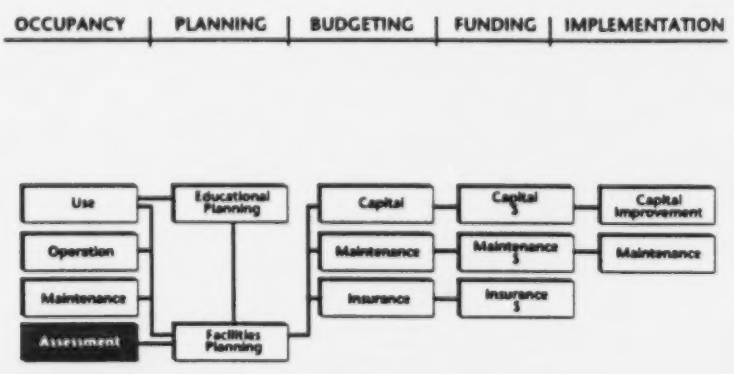
- user complaints
- maintenance needs
- preventive maintenance needs
- specific environmental hazards
  - asbestos
  - lead paint
  - lead
  - radon
  - other
- structural hazards
- fire/life safety
- environmental quality
- educational adequacy
- energy use/conservation
- accessibility
- other

Specific surveys or inspections may be mandated by federal, state or local laws/programs (external pressures). Others may be required by the district's own management practices (internal pressures).

These surveys/inspections may be carried out by a variety of entities:

- federal personnel (OSHA, EPA)
- state personnel (fire marshal, code enforcement, environmental, health, education)
- city/county personnel
- school district personnel (custodial, facilities, principals, other)
- school district contracted personnel (e.g., asbestos)
- consultants

These surveys may or may not be coordinated as to schedule, content, personnel etc. The surveys can benefit from the use of prepared inspection forms or checklists, though not all districts use them. (See Attachment C, excerpt from New York City Case Study for a systematic use of inspection forms). Finally, districts may vary as to the extent and specific nature of their record keeping and reporting.



PROCESS – PHASES AND ACTIVITIES

PLANNING

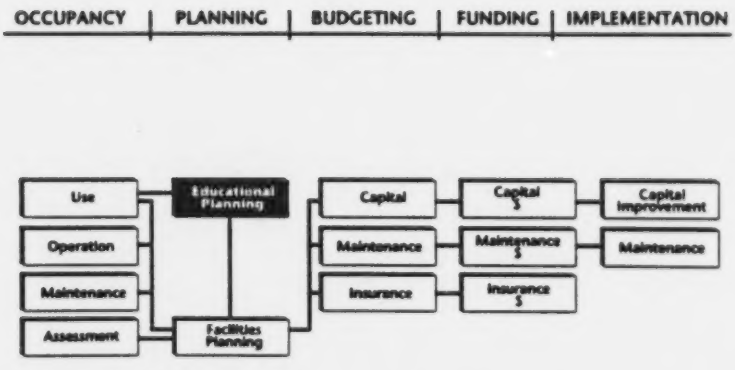
The planning phase consists of the projection and forecasting of future needs, which may be governed by policies adopted by the Board, and in some cases, by state requirements. It can be carried out periodically or continuously, and can vary as to the time period covered by the projections and forecasts. Planning functions may be carried out by the school district administration, with or without the assistance of consultants.

Planning consists of two separate but related activities----educational planning and facilities planning.

Educational Planning

Educational Planning attempts to formulate future educational programs and their support needs by analyzing and forecasting several factors, such as:

- demographics (population growth or decline, neighborhood shifts, etc.)
- educational philosophy, including special education, adult education, etc.
- educational technology (computers, telecommunication, video-communication, etc.)
- cultural and sociological factors
- federal and state mandates
- equity and civil rights



PROCESS – PHASES AND ACTIVITIES

Facilities Planning

The preparation of long range facility plans, strategic facility plans, or some similar designation, may be mandated by the state or generated by the district. It combines the products of two distinct activities----the educational plan and the facilities assessment database (see above)---- into a detailed projection of facility requirements. The projection may cover a defined time frame, such as five years.

Different districts may use different classifications of projects in their facilities plans, reflecting a variety of legal, administrative, jurisdictional and other factors. A comprehensive facilities plan should include the following elements (however they may be classified):

- new construction
- additions to existing buildings
- renovations of existing buildings
- building systems replacements
- building systems repairs
- scheduled maintenance
- preventive maintenance
- building disposition (change of use, sale, demolition)

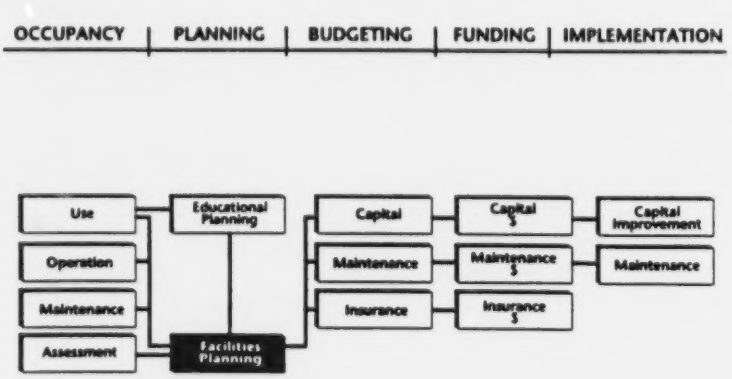
The plan will identify the time frames in which each project is to be accomplished, and may include cost estimates.

Some experts have conceptulized the facilities plan as consisting of four general categories, which may provide guidance for budgeting:

- plant renewal
- plant adaption
- catchup maintenance
- new construction

If effective, the facilities plan will be used as a budgeting tool, and will provide direct inputs into the budget process. It should be revised and updated on a routine basis so as to reflect:

- changes in the educational plan
- revised facilities assessments
- budgeting and funding realities
- implementation



PROCESS – PHASES AND ACTIVITIES

BUDGETING

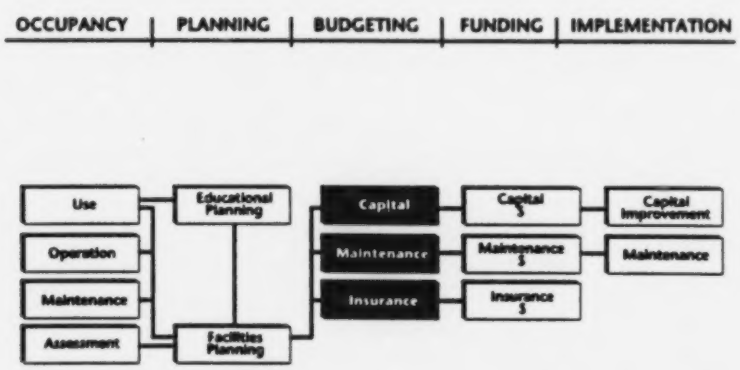
The budgeting phase consists of the projection of future financial resources required to meet future needs. It is carried out annually (covering a period of one or more years) by the school district administration (superintendent, business manager) and the board. There are three elements of the budget which are relevant to the discussion of facilities management:

- capital
- maintenance
- insurance

Capital budgets generally relate to the acquisition of buildings and major systems, the occurrence of which is not annual or repetitive, and which can therefore be amortized.

Maintenance budgets generally relate to recurring annual expenditures, and address existing inventories of buildings and systems without adding to the inventories. However, the distinction between capital and maintenance budgets varies between school districts. At one extreme is a total separation, mandated by law, labor jurisdiction or other factors. At the other extreme is a rather unclear separation between the two. Maintenance budgets are often part of the operations budgets, or general fund budget, with maintenance funds often reportedly being used to cover shortfalls in operations. (The latter practice has reportedly contributed to the growth of deferred maintenance in many school districts.)

Insurance budgets may be used in different ways, including the purchase of insurance, contributions into a regional or statewide risk and insurance pool, and the funding of a self-insurance reserve. Of relevance to facilities management are property and general liability insurance.



PROCESS – PHASES AND ACTIVITIES

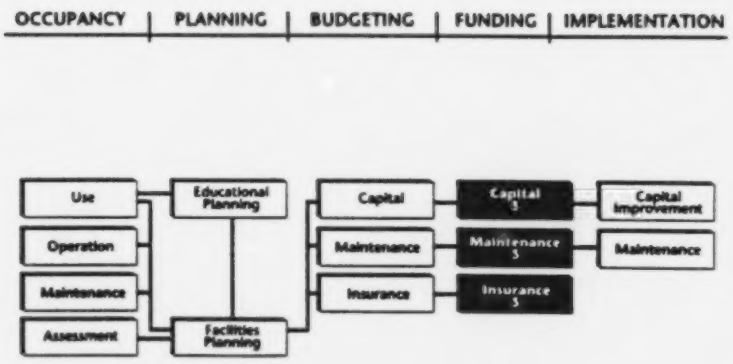
FUNDING

The funding phase consists of those activities required to obtain the financial resources to meet the budgets. The funding of school budgets in general, and of the three budget elements noted above, varies from district to district.

There is great variation among states as to the extent of state contribution to local school budgets. Some states limit their contribution to capital budgets and others to a general fund. States may use different formulas for the allocation of resources to school districts in order to achieve equalization.

School districts can fund their budgets by various combinations of taxation and debt, both of which are in some cases controlled or limited by state constitutions or by periodic voter initiatives. Different school budgets may be subject to varying requirements of approval of taxation and/or debt by the electorate. At one extreme, school boards are free to issue bonds without additional approval. At the other extreme, there are districts where local school budgets must be voted at town meetings.

There are many local variations in funding where school districts, municipalities and counties have overlapping jurisdictions.



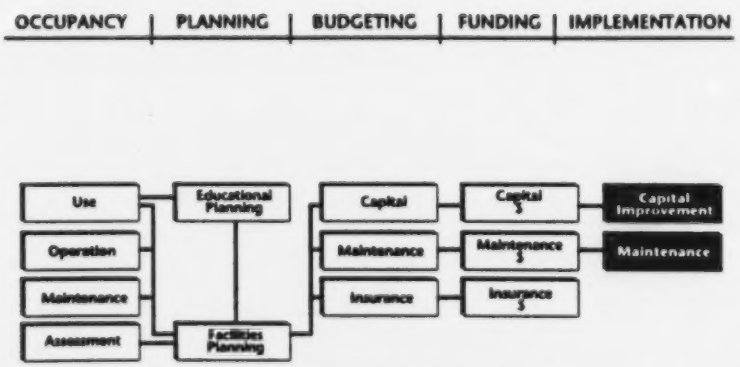
PROCESS – PHASES AND ACTIVITIES

IMPLEMENTATION

The implementation phase includes design and construction, and can be broken down into three categories of projects, of which the latter two are relevant to existing buildings:

- acquisition projects
- capital improvement projects
- maintenance projects

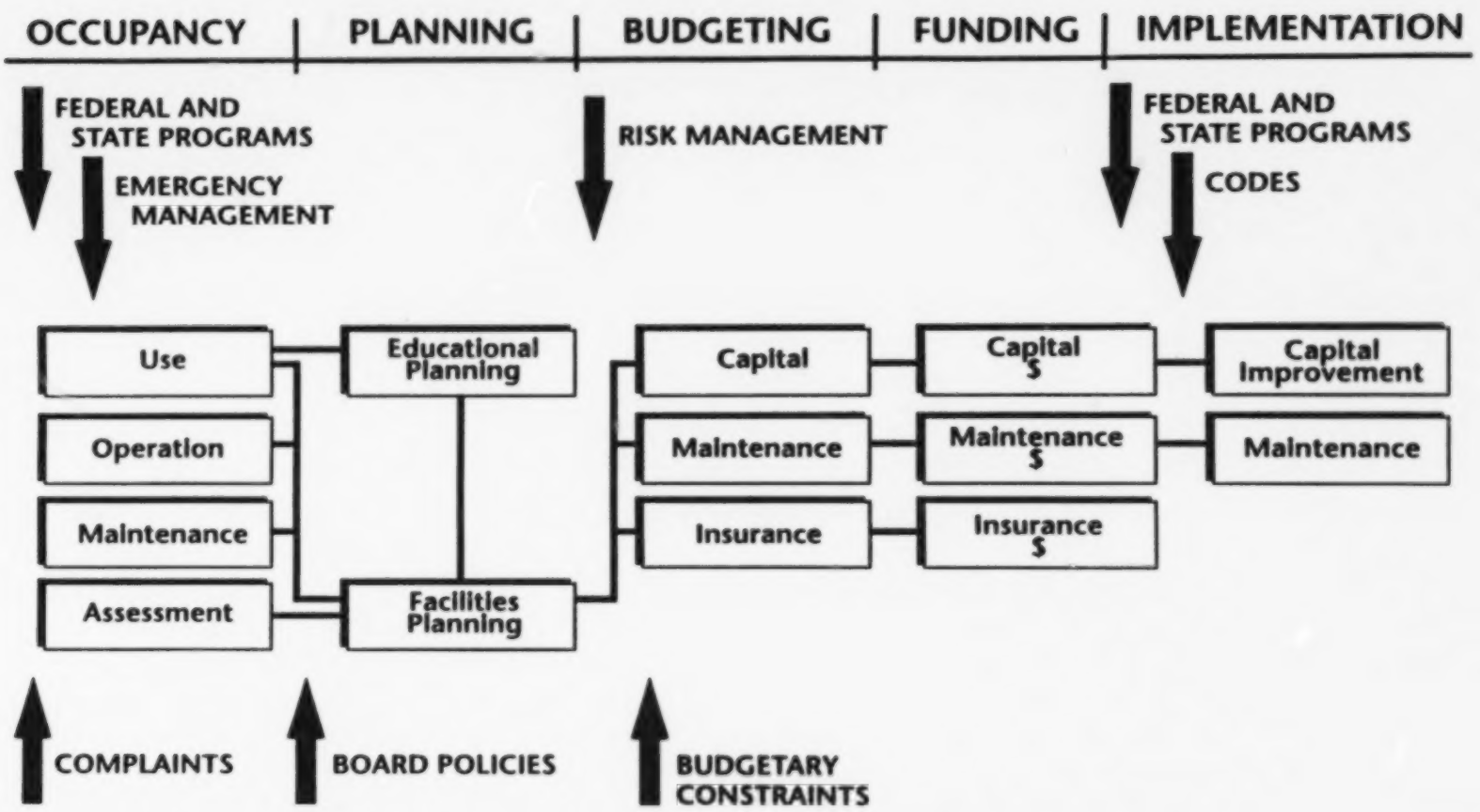
Capital improvement and maintenance projects are managed by district staff and carried out by district staff and by contractors. The management of these two categories may be separated or combined, depending on issues of labor jurisdiction and legal authority.



PROCESS – PHASES AND ACTIVITIES

II. PRESSURES ON THE FACILITIES MANAGEMENT PROCESS AND RELATED SEISMIC CONSIDERATIONS

The forces, or pressures, which influence the facilities management process can be thought of as INTERNAL----those generated from within the school district and its administration, and EXTERNAL----those imposed on school districts by outside entities. Both internal and external pressures can be or can become the sources for seismic considerations influencing facilities management decisions.



External (↓) and Internal (↑) Pressures

B – PROACTIVE FACILITIES PLANNING

Internal pressures are:

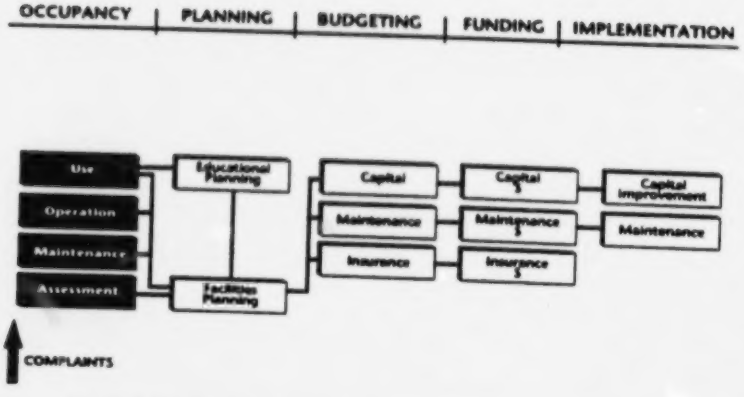
- complaints generated in the occupancy phase,
- policies adopted by the Board, and
- budgetary constraints.

By definition, the proactive strategic facilities planning activity becomes the vehicle for channeling these three internal pressures, and others, generated by the planning process, into capital improvements and maintenance.

Complaints Generated in the Occupancy Phase - These complaints, together with the results of the facilities assessment activity provide inputs into the facilities planning activity.

Seismic Considerations - There are examples where the occurrence of school damage in an earthquake (e.g., 1949 Seattle) led to seismic retrofit activities. This may occur again as a result of the school damage experienced in the recent moderate Northwest Oregon earthquake (March 25, 1993). When school occupants become informed of the potential seismic hazards, they may provide the pressure leading to seismic retrofits ("the squeaky wheel").

School facilities assessments and strategic plans may address seismic vulnerability. For examples see Attachment D for excerpt from Seattle Case Study and Attachment E for excerpt from Portland Case Study.



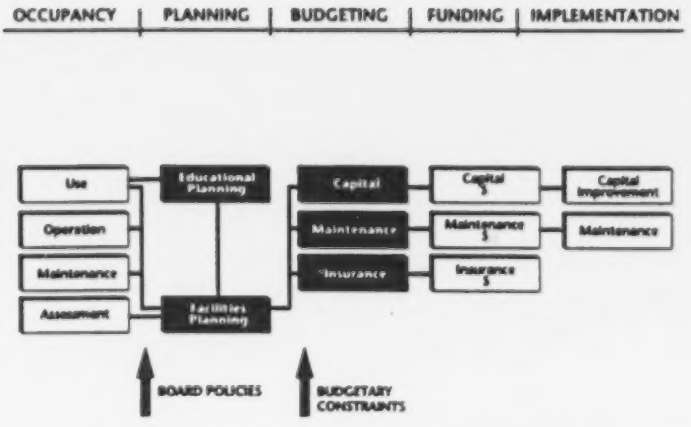
PRESSURES AND SEISMIC CONSIDERATIONS

Policies Adopted by the Board - School Boards may, from time to time, adopt written policies on issues of political and social significance. These policies guide the actions of the district administration.

> **Seismic Considerations - School Boards may adopt policies addressing seismic issues.**

Budgetary Constraints - Political and economic conditions in many parts of the country have placed severe limitations on school budgets. This problem is often exacerbated by a variety of unfunded mandates imposed on school districts by the federal and state governments (external pressures).

> **Seismic Considerations - The strategy of integrating incremental seismic retrofit with other work, which is an integral part of this facilities management model, can provide a method for addressing seismic risk reduction within budget constraints.**



PRESSURES AND SEISMIC CONSIDERATIONS

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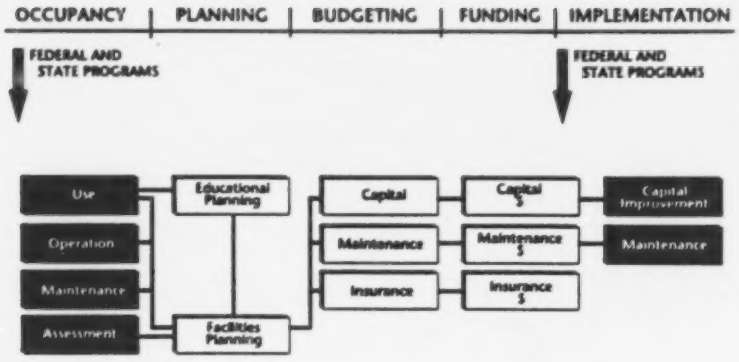
External pressures and their respective seismic considerations should be channeled into the facilities planning activity and should be addressed therein. They fall into several categories:

Federal and State Mandates and Programs - Federal and state programs may establish requirements affecting the occupancy and implementation phases which have facilities implications (e.g., ADA and OSHA requirements). Usually these requirements address issues of health and safety. They impose costs on school districts, and while sometimes they are accompanied by funding, often they are not. Additionally, governmental funding programs may entail facilities requirements in participating school districts (e.g., energy conservation).

Seismic Considerations - Seismic retrofit mandates for schools have existed in California since the 1930s. Other Federal and state programs that have facilities implications (e.g., improved access and safety, energy conservation and technology improvements) provide opportunities for integrating incremental seismic retrofit, which is an integral part of this facilities management model.



Codes and Code Enforcement - Building codes rarely include requirements on the occupancy phase of buildings, that is, on use, operation or maintenance. There may be other ordinances that do impose such requirements. However, building codes do contain requirements on the implementation phase, in cases of repair, renovation or addition to existing buildings. These requirements may be enforced by a state or local agency, or there may be a requirement that school district staff be responsible for the enforcement (for example, in the state of Utah).

Seismic Considerations - State and local building codes may impose seismic retrofit requirements on existing buildings. Recent examples include codes or statutes passed in Utah[1], Massachusetts[2], Arkansas[3] and Missouri.[4]

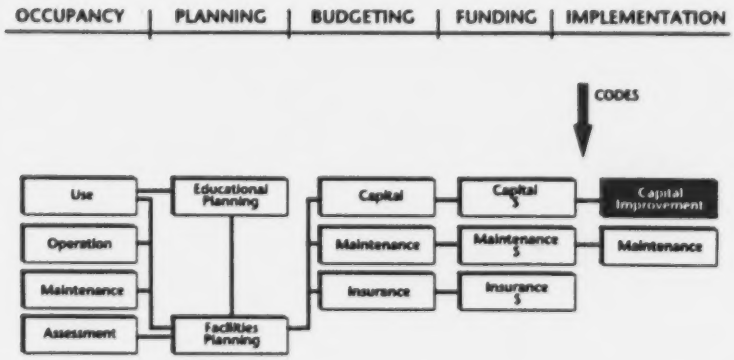
---

1 **R156-56-20 Amendments to the UBC**
[Statewide amendments to the Uniform Building Code]

2 **Proposed Revisions to Massachusetts State Building Code: Structural Provisions for Existing Buildings**
[September 17, 1992]

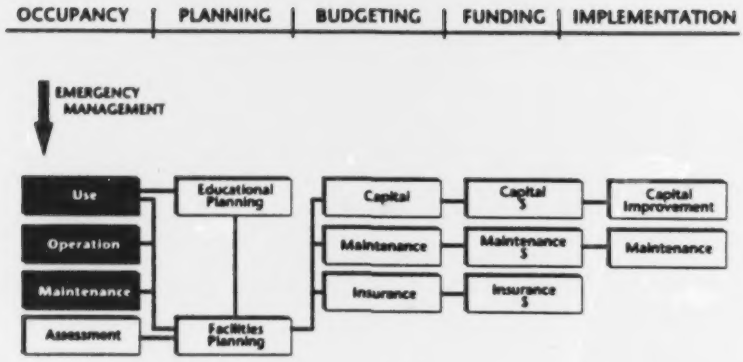
3 **Act 1100 1991: An Act to Safeguard Life, Health and Property by Requiring Earthquake Resistant Design for All Public Structures to be Constructed or Remodeled Within the Boundaries of this State Beginning September 1991.**

4 **Revised Statutes of Missouri 1992: Earthquakes - Seismic Building and Construction Ordinances 319.200**



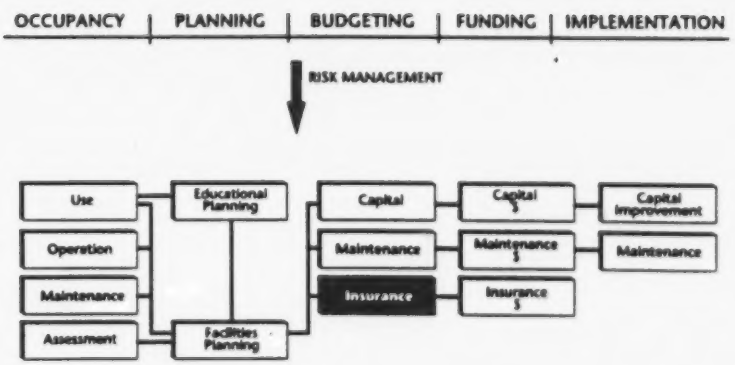
Emergency Management - State or local emergency management agencies may assign specific roles that school buildings must perform in case of natural disasters, including earthquakes. This may affect the occupancy phase by requiring periodic exercises involving building occupants.

Seismic Considerations - Emergency management plans related to the role of school facilities in a disaster may be general and broad, or detailed and specific. In some cases, specific schools are assigned specific functions they are to perform in the post-disaster environment, such as emergency shelter, feeding and disaster assistance. Portland, Oregon's emergency response plan is an example of such specific planning. (See Attachment A for excerpt from Portland Case Study, dated April 8, 1994.) In such cases a legitimate question is "In what condition will the building be following an earthquake?"



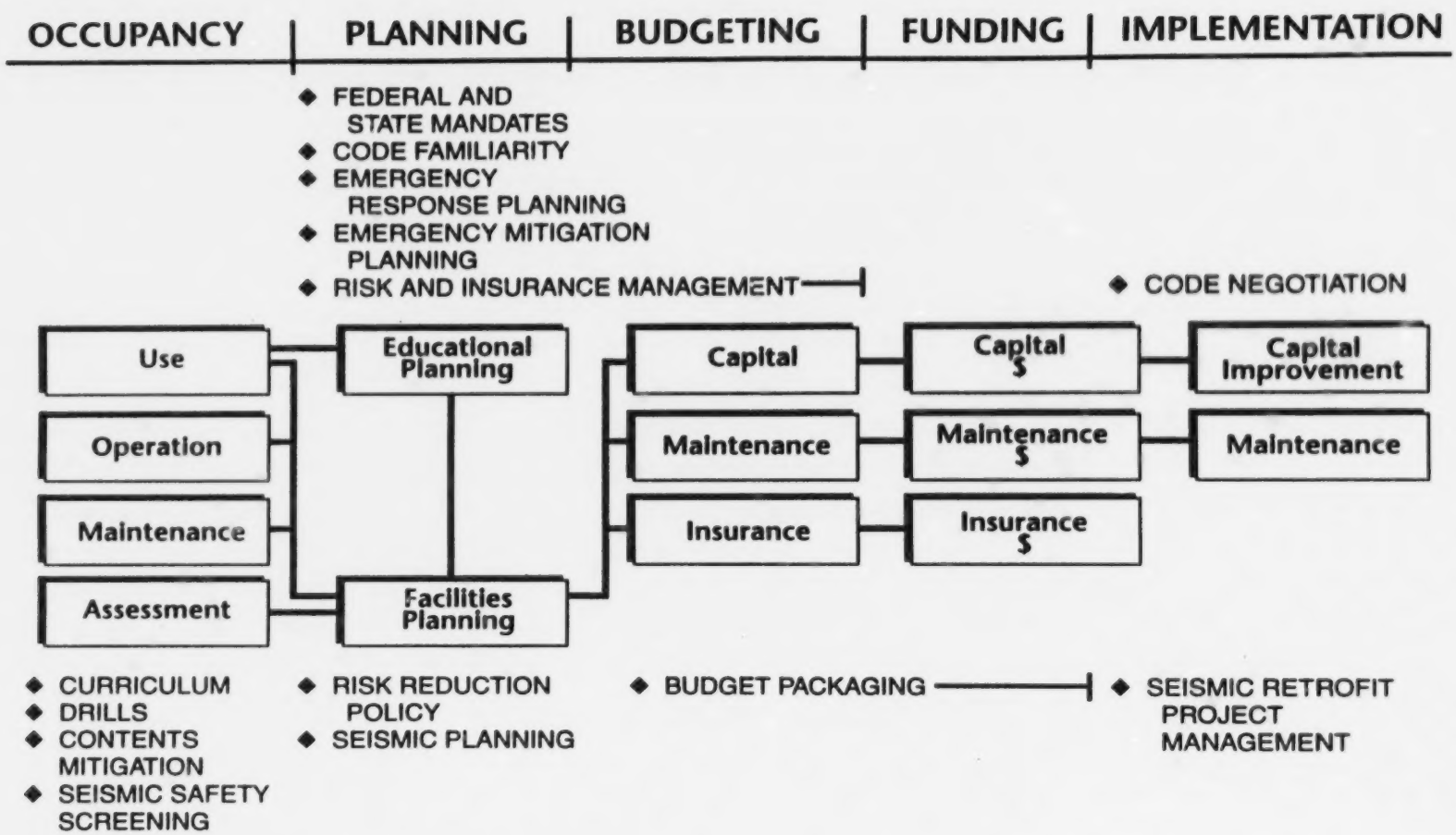
Risk and Insurance Management - State and/or local school district risk and insurance management may have a direct or indirect role in the budget phase of the process, as regards the decisions related to insurance. These decisions include self insurance (i.e., taking the losses), purchasing insurance, and taking loss reduction measures (i.e., mitigation).

Seismic Considerations - In areas of seismic risk the risk of building loss or damage, the risk of occupant deaths or injuries, and the risk of school district liability must all be assessed. The decision of whether or not to seek earthquake property and casualty insurance coverage and general liability coverage must be made. Insurance companies which offer such coverage may offer incentives to customers who undertake loss reduction measures in the form of seismic retrofit.



III. SEISMIC RISK REDUCTION ACTIVITIES

Consider adding the following activities to the current facilities management process. They will contribute to the reduction of seismic risk in a district's existing building inventory. These activities relate to the internal and the external pressures influencing the process.



Seismic Risk Reduction

B – PROACTIVE FACILITIES PLANNING

B-21

INTRODUCTION

FEMA has developed a series of documents which provide guidance for addressing the seismic vulnerability of existing buildings. These consist of:

- Rapid Visual Screening of Buildings for Potential Seismic Hazards ---- A technique for screening out the relatively more hazardous buildings in a large inventory, so that they can be addressed in more detail. (FEMA 154 & 155).

- NEHRP Handbook for the Seismic Evaluation of Existing Buildings ---- Engineering guidance on how to evaluate categories of buildings in order to determine effective retrofit measures. (FEMA 178).

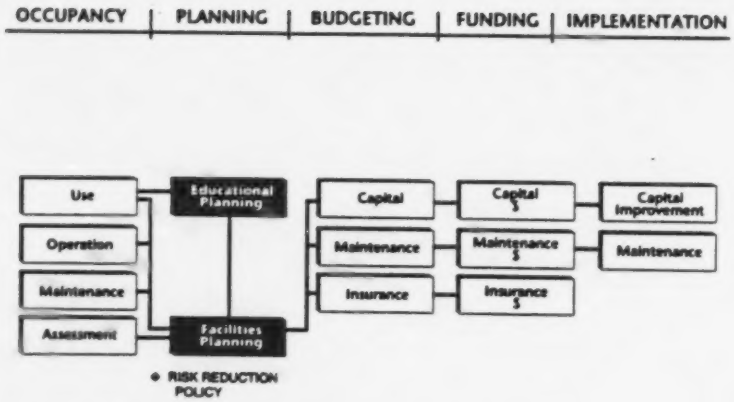
- NEHRP Handbook for Seismic Rehabilitation of Existing Buildings ---- Specific techniques of effective retrofit. (FEMA 172).

The first two FEMA documents relate to ASSESSMENT. They define and utilize structural building classifications, some of which do not apply to school facilities in the US, and others of which need to be expanded and broken down further in order to be applied effectively to common school building types. Furthermore, Rapid Visual Screening is a technique applicable to large inventories of buildings, and is therefore potentially applicable in large school districts. Small and medium districts can probably arrive at the screening result using a more abbreviated technique. The accompanying documents A Guidebook to FEMA 154 for Use in the Screening of School Buildings and A Guidebook to FEMA 178 for Use in the Evaluation of School Buildings, which have been developed on the basis of these two FEMA documents, are specifically applicable to existing school buildings.

The third of the FEMA documents mentioned above (FEMA 172), together with the accompanying document Incremental Seismic Retrofit Opportunities, will help district facility planners in the PLANNING and IMPLEMENTATION phases.

B.1 Risk Reduction Policy

Get the Board to adopt a policy statement on seismic risk reduction.



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B.2 Curriculum

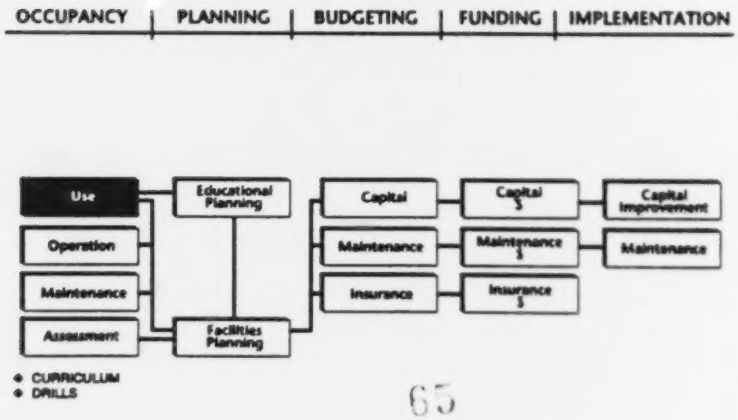
Introduce balanced awareness of seismic risk within the school population (students, teachers, parents) by introducing the subject into the curriculum. Provide timely and appropriate information such as the experience of school facility performance in recent earthquakes..

See FEMA 159, EARTHQUAKES - A Teacher's Package for K-6 Grades. (See Attachment B for a short description and ordering instructions for this and other related publications.)

B.3 Drills

Introduce earthquake drills and appropriate earthquake preparedness materials into the regular school program.

See FEMA 88, Guidebook for Developing a School Earthquake Safety Program, and FEMA 88a, Earthquake Safety Activities for Children. (See Attachment B for a short description and ordering instructions for this and other related publications.)



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B.4 Building Contents Mitigation

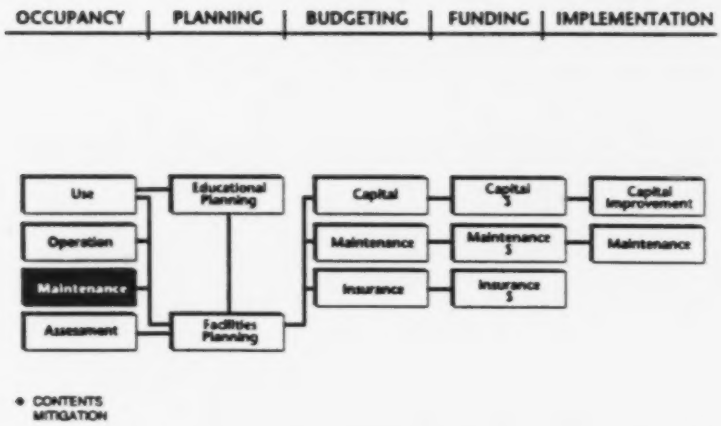
Implement measures to reduce or eliminate risks from earthquake damage to equipment, furnishings, and unsecured objects in buildings, as part of routine or preventive maintenance.

Work may include such items as:

- bracing ceiling panels and fixtures,
- anchoring of water heaters and piping,
- fastening desktop equipment,
- anchoring bookcases and storage shelves,
- restraints of objects on shelves, and
- addition of automatic gas shutoffs.

See FEMA 241, Nonstructural Earthquake Hazards in Schools. (See Attachment B for a short description and ordering instructions for this and other related publications.)

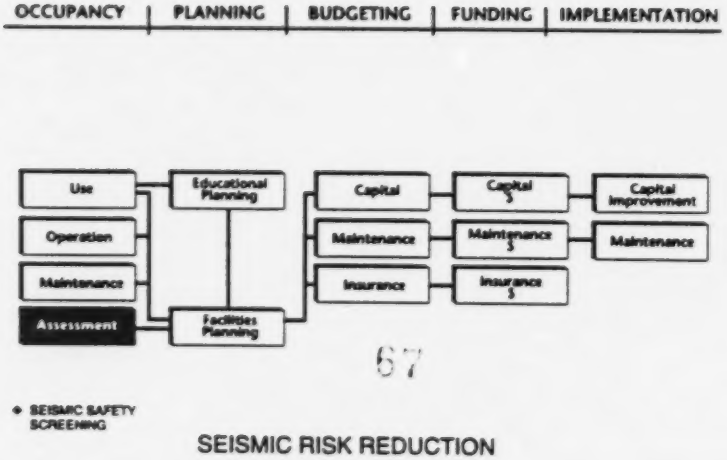
Similar documents have been published by the states of California (Identification and Reduction of Nonstructural Earthquake Hazards in California Schools, Bay Area Regional Earthquake Preparedness Project and Office of the State Architect, Febraury 1990) and Washington (Non-Structural Earthquake Hazards Manual, Superintendent of Public Instruction, July, 1989).



B.5 Seismic Safety Screening and Evaluation

Seek efficient ways to incorporate appropriate seismic screening and evaluation procedures into facility assessment activities. Begin with a determination of the status of the archival records. If building plans are available, a document review for the determination of building types is the first step in seismic screening.

See Attachments D and E for excerpts from Seattle and Portland Case Studies, respectively.



SEISMIC RISK REDUCTION

B.5 Seismic Safety Screening and Evaluation (continued)

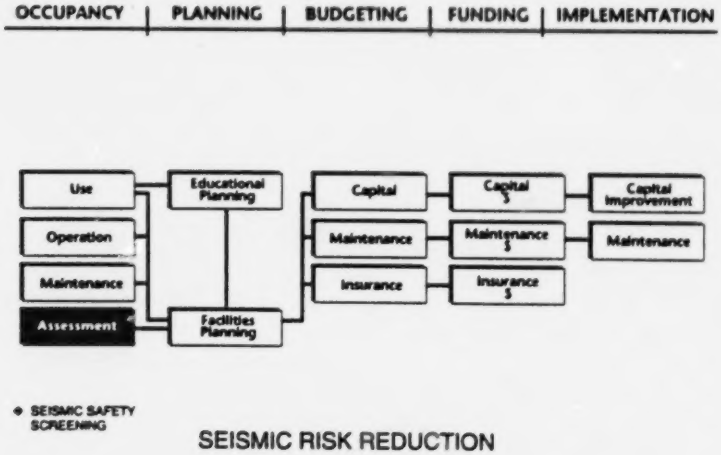
Incorporate an appropriate technique of screening for seismic vulnerability, based on FEMA 154 (Rapid Visual Screening) and on A Guidebook to FEMA 154 for Use in the Screening of School Buildings, into current surveys/inspections. This includes assigning the screening to the appropriate inspectors.

Several questions need to be addressed:

- Who currently carries out the various surveys/inspections?
- Are the various surveys/inspections coordinated?
- What is the level of technical expertise of the inspectors?
- Can current inspectors be assigned additional inspection tasks?
  - Would it require additional training?
  - Would it require additional staffing?
  - Would it require an expansion of existing jurisdictional authority?
- How would the additional inspections be funded?
- Do the inspectors currently use a checklist or other survey instrument?
  - If yes, does it include direct or indirect indicators of seismic vulnerability?
  - If it does not, can they be added?

Consider the use of engineering students or volunteer architects and engineers.

In some cases, the screening will suggest specific seismic retrofit opportunities, without requiring additional engineering and risk analyses. In other cases, incorporate appropriate evaluation techniques based on FEMA 178 (Handbook for Seismic Evaluation) and on A Guidebook to FEMA 178 for Use in the Evaluation of School Buildings.

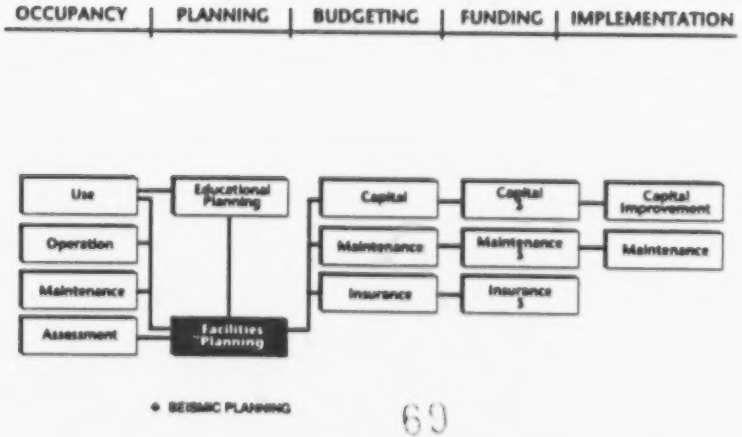


B.6 Seismic Safety Planning for Facilities

Given that specific seismic retrofit opportunities will be identified by the preceding screening and evaluation activities, four specific tasks of facilities planning should be undertaken:

(1) Carry out additional engineering and risk analyses in order to prioritize the seismic retrofit or disposal opportunities in terms of risk reduction. Apply a "worst first" approach.

(2) Break down the specific seismic retrofit opportunities into discrete incremental retrofit measures.



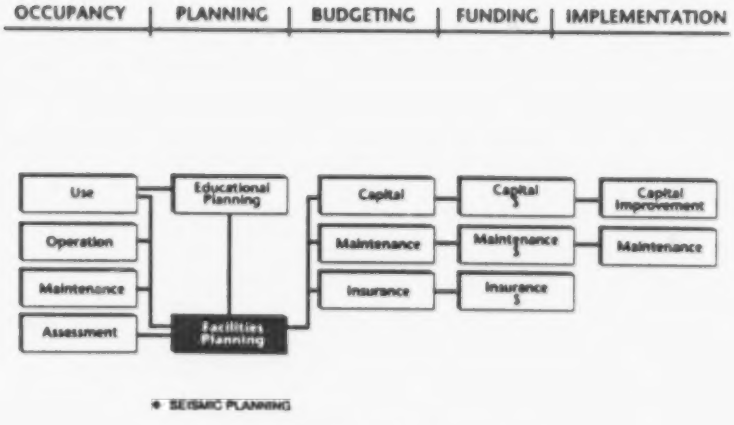
B.6 Seismic Safety Planning for Facilities (continued)

(3) Link each incremental retrofit measure with related other facilities work, using Incremental Seismic Retrofit Opportunities as a reference.

The related work classifications may differ from district to district, but will fall into one or more of the following categories:

- Additions to existing buildings
- Renovations of existing buildings
- Building systems replacements
- Building systems repairs
- Preventive maintenance

(4) Consider developing and maintaining a roster of architects, engineers and other consultants with specific expertise in the fields of seismic assessment of buildings, seismic design and risk analysis.

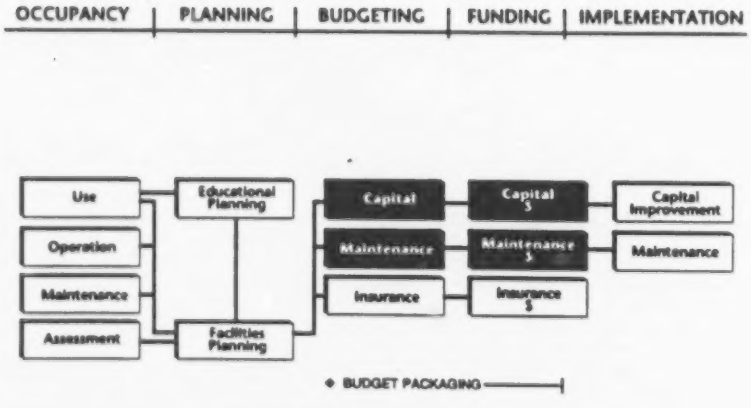


B.7 Budget Packaging

The district business manager and facilities manager, or the individual(s) performing these functions, should carefully plan how to present the incremental seismic retrofit budgets so as to maximize the probability of their being approved, given the political and financial realities of the district.

The facilities capital improvements and maintenance budgets are direct outputs of the facilities planning process. The budget, however, is also a tool for raising the necessary funds, through a board decision, a bond election, or other process. Because it is unlikely for school districts in most parts of the US to raise funds for a comprehensive seismic retrofit program of all the school facilities, the incremental retrofit approach appears to provide a viable alternative. In order to fund this approach in some districts it may be necessary to "package" incremental seismic retrofits.

In regions of moderate seismicity and low seismic awareness , e.g. New York and New England, it may be useful to concentrate on retrofit measures which also reduce the risk of loss due to other natural or man-made forces, such as high winds. Such a multi-hazard approach will help to overcome the low priority placed on seismic risk in those regions.



SEISMIC RISK REDUCTION

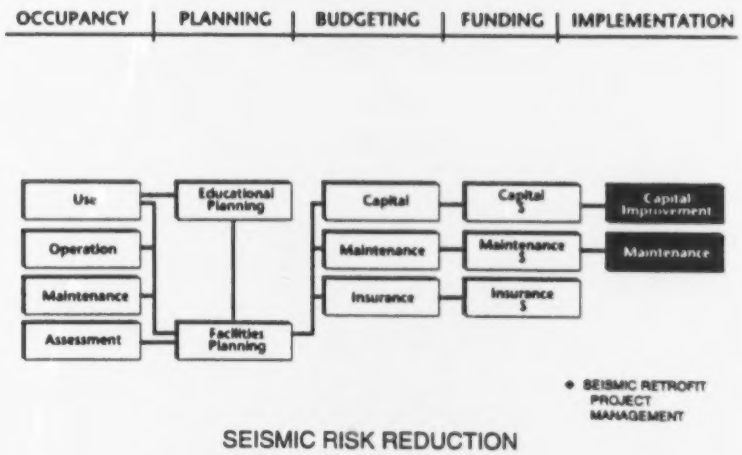
B.8 Seismic Retrofit Project Management

The implementation of the incremental seismic retrofit measures in combination with other building work may require detailed project design and bid-packaging.

- **Consider designating a Project Manager familiar with the rationale of incremental seismic retrofit, as the District's representative on the project team.**

- **Present the rationale behind the retrofit measures to the professionals (in-house or consultant architects/engineers) responsible for preparing the bid documents for projects which include incremental seismic retrofit work. This is necessary to assure that the risk reduction objectives are actually achieved.**

- **Conduct a pre-bid conference to fully explain the seismic risk reduction objectives to all prospective bidders.**



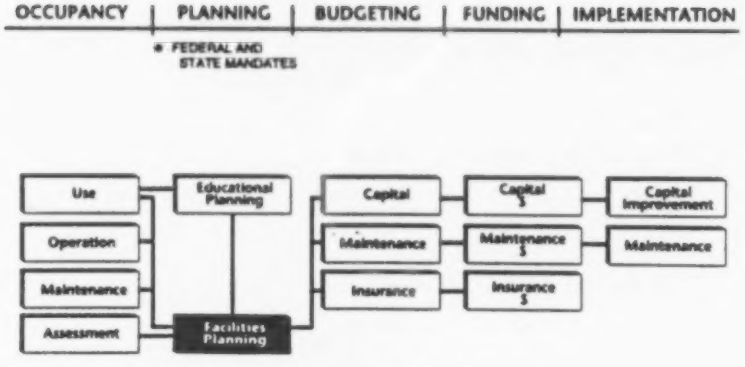
SEISMIC RISK REDUCTION

B.9 Federal and State Mandates and Programs

Become familiar with the seismic retrofit requirements currently imposed by federal and state programs, or under consideration for the future.

In the case of small and medium school districts this might best be accomplished by means of a service provided by a Regional Educational Service Agency, by a state agency, or an applicable trade association.

In the case of large districts this may be accomplished by assigning a "seismic regulations watch" to an individual in the facilities department.

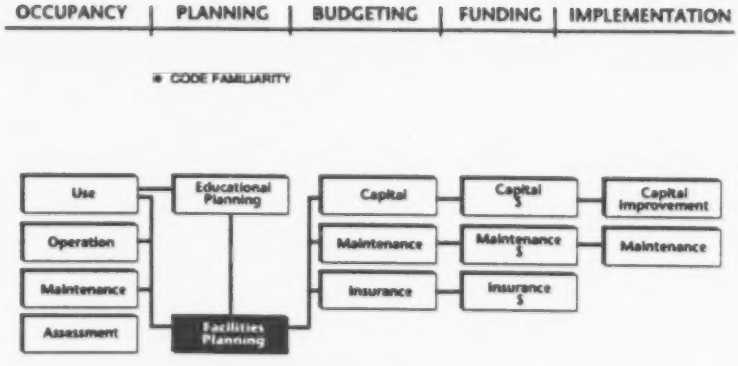


B.10 Codes and Code Enforcement/Familiarity

Become familiar with the seismic retrofit requirements of building codes and other codes and ordinances, either currently imposed or under consideration for the future.

In the case of small and medium school districts this might best be accomplished by means of a service provided by a Regional Educational Service Agency, by a state agency, or an applicable trade association.

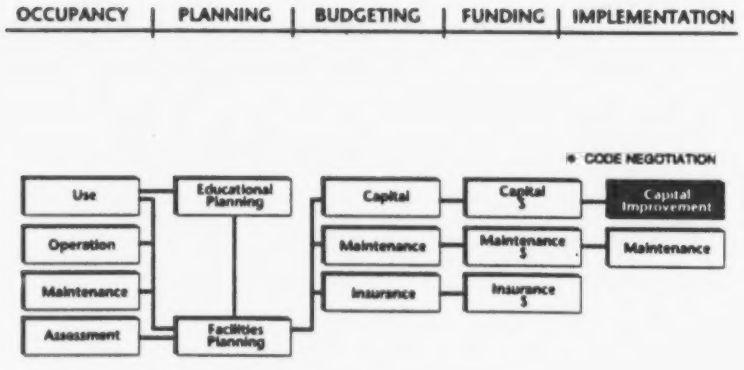
In the case of large districts this may be accomplished by assigning a "seismic codes watch" to an individual in the facilities department, or by assigning seismic responsibility to a general code monitoring activity if one exists.



B.11 Codes and Code Enforcement/Negotiation

Inform the applicable code enforcement authorities of the district's planned incremental seismic retrofit actions and their intent. If applicable, negotiate an approval optimizing life safety and risk reduction.

Some code enforcement agencies negotiate required life safety and other improvements with existing building owners who undertake building rehabilitation. Such negotiations attempt to strike a compromise between safety, feasibility and affordability (see Attachment F for excerpts from Portland Case Study). Seismic safety improvements may be acceptable tradeoffs for some other improvements, and the proposed voluntary seismic retrofit could become a negotiating point for the school district.



B.12 Emergency Management/Response Planning

- **Establish liaison with emergency management agencies and volunteer agencies (e.g., the Red Cross).**

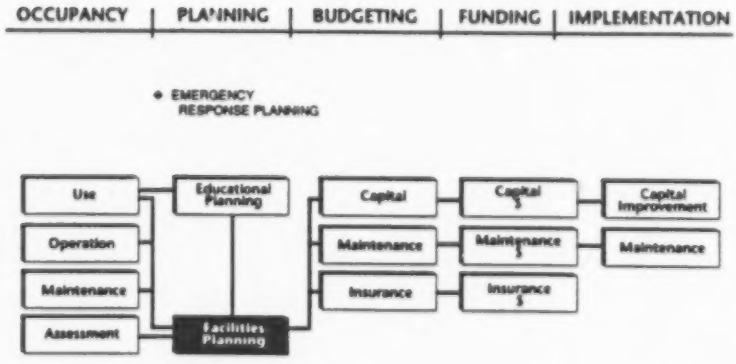
- **Become familiar with the post-disaster role of schools in the local emergency response plans.**

  Get the post-disaster role defined in as specific and detailed a way as possible, assigning specific functions to specific facilities. Then ask the emergency planning team the question of what condition those specific facilities are likely to be in following an earthquake, and simulate that condition in subsequent exercises.

- **Determine the impact of the post-disaster role on seismic retrofit priorities.**

- **Become active in the emergency planning process.**

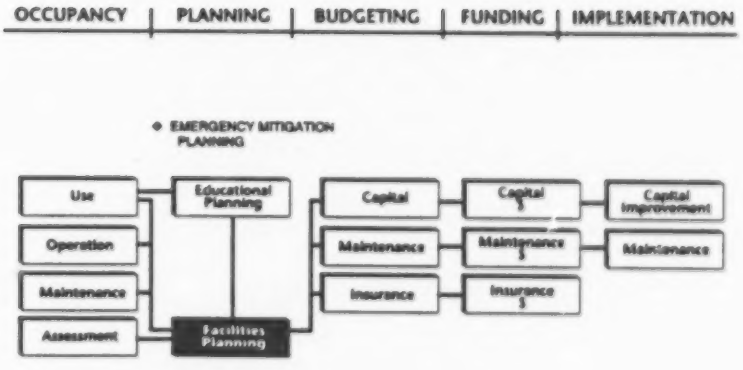
- **Establish full coordination between a district's emergency planning and facilities planning functions. Such coordination may lead to a sharing of the assessment activities between the two functions.**



B.13 Emergency Management/Mitigation Planning

Establish liaison with emergency management mitigation planning at the state and local levels. Work toward the incorporation of school district earthquake mitigation into the state's mitigation plans, and the recognition of the district's incremental seismic retrofit measures as elements of the mitigation plans.

Federal resources and funds may be available to states for the support of disaster mitigation planning activities. Federal matching funds may be available for the implementation of disaster mitigation in a presidentially declared disaster. These resources are available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 100-707). School districts should make every effort to avail themselves of these resources.



B.14 Risk and Insurance Management

- **Assess the earthquake risk and vulnerability of all facilities.**

- **Establish full coordination between risk management and facilities planning.**

  Become fully informed on the district's approach to seismic risk reduction.

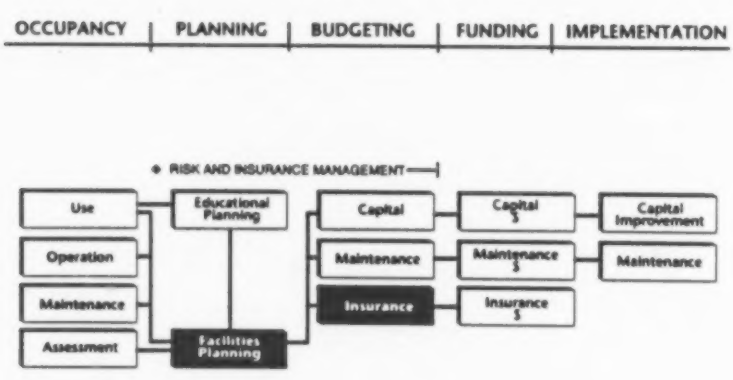
- **Evaluate the need for earthquake property and casualty insurance, as well as liability coverage.**

- **Evaluate the impact of loss reduction measures.**

- **Determine the availability of incentives for seismic retrofit from insurance carrier.**

- **If school district is part of a regional or statewide risk and insurance pool, explore opportunities for cost sharing of seismic assessment and planning costs.**

See Attachment G for excerpt from Ogden Case Study.



ATTACHMENT A

Excerpt From Portland Case Study

April 8, 1994

Emergency Management

State - Oregon Emergency Management is in the Executive Department. There is a designated Earthquake Program Coordinator, whose main effort is concentrated on raising earthquake awareness. The State's emergency plan does not yet include a written earthquake component, although one is reportedly to be developed. The role of public schools in the State's emergency plan is generic for all emergencies, with detailed planning, if any, left to the local jurisdictions:

- Temporary protection of children till they can be released to someone's care.
- Mass care shelter.

It is unclear whether the office of the State Superintendent of Public Instruction is officially cognizant of this role, or that it is somehow reflected in specific plans.

While we have no information on whether the State requires local jurisdictions to prepare emergency plans, it has not issued any guidance to local jurisdiction on earthquake emergency planning.

A statewide earthquake exercise was conducted in early 1991. It involved playing out an earthquake scenario at the State Emergency Operations Center. Portland Public Schools were involved in the exercise.

Earthquake drills in schools are required by State legislation (Senate Bill 66).

Metro - The Metropolitan Service District, which is a regional government planning body in the Portland metropolitan area, adopted an Emergency Management Work Plan on Earthquake Preparedness in November 1991. Its purpose in FY 1991-92 was to initiate a regional earthquake planning effort with a focus on mitigation. The plan consisted of several parts:

- Working with DOGAMI to develop a seismic hazard database utilizing Metro's Regional Land Information System (RLIS).
- Assessing seismic risks at Metro facilities.
- Developing a regional seismic hazards need assessment.
- Researching program funding alternatives.
- Establishing Metro's role in regional emergency management.
- Strengthening the roles of local officials, local emergency planners and local land use planners in mitigating the impacts of an earthquake.

Some federal support from FEMA was obtained, and in August 1992 Metro undertook the Metro/ DOGAMI Earthquake Scenario Pilot Project. The project initially involved a study area of about 60 blocks within the City of Portland. The area is bisected by the Willamette River, and includes about 180 buildings, rail lines, overpasses, port structures and lifeline systems. It also includes one public school. The project has subsequently been expanded to include the entire Portland Quadrangle (USGS), using data from the building department (in lieu of field data). The results of the study will be used to facilitate region-wide discussion of seismic hazards problems and how to deal with them cooperatively, and support the development of the regional emergency managers' earthquake planning projects.

Results of the study have already been used to support a federal grant request for a regional earthquake vulnerability study, which has been funded.

Portland - The Portland emergency plan assigns post-disaster functions to different bureaus. It is not hazard-specific, though it is recently placing more focus on earthquake disaster. An earthquake regional plan is currently being developed. (It is unclear if this plan is being developed by Metro or by Portland.) It will be based on the identification of geographic islands of isolation in case of an earthquake. Within each such island two facilities will be identified: one for response coordination (probably a fire station) and one for public shelter (probably a school). Thesefacilities will undergo seismic analysis. The Office of Emergency Management has reportedly requested the Bureau of Buildings to carry out the analysis. The latter has indicated that it would contract out the analysis work. In addition, the Office of Emergency Management has identified critical public facilities in Portland, and has recommended that seismic analysis be undertaken. This has not yet been done.

An earthquake exercise involving 4,000 people was conducted in 1990, but the schools were not included. On the other hand, the risk manager at Portland Public Schools reported that they had participated in a regional earthquake drill even prior to the passage of Senate Bill 66. Portland Public Schools will participate in a regional earthquake drill planned for the Spring of 1994.

Portland Public Schools - The Director of the Physical Plant Division is also the Emergency Manager in Portland Public Schools. So far, most emergency management effort has gone into a program to upgrade life safety (i.e., egress) in the schools, in which the Portland Bureau of Buildings and Fire Prevention Bureau are involved. The program involves negotiated incremental improvements in two-year increments. So far 14 buildings have been upgraded, at a cost of $1.5 million. Sixty-six buildings remain with some life safety deficiencies.

The Director of the Physical Plant Division is Portland Public Schools' representative on the Technical Advisory Council established by the Portland Office of Emergency Management, which meets periodically on both Portland's and Metro's emergency planning activities. However, Portland Public Schools does not seem to be a central player in either activity.

The Superintendent has issued a directive to implement Senate Bill 66 (earthquake drills), and this will result in an updating of the Portland Public Schools Emergency Handbook which will explicitly deal with earthquakes. Meanwhile Portland Public Schools reportedly leads the state in earthquake drills, probably as a result of the training provided by the Office of Emergency Management to the

school principals. Thirty minutes per month are devoted to this activity, but it reportedly does not generate the classroom enthusiasm that it should.

Some seismic analysis of Portland schools was reportedly carried out in the 1960s, but it does not appear to have led to any seismic rehab work. While seismic analysis was being planned in the context of ongoing capital improvement planning (see below), it was given added impetus by the March 25, 1993 earthquake, in which several Portland schools were slightly damaged.

ATTACHMENT B

Federal Emergency Management Agency
School Earthquake Safety and Education Program

FEDERAL EMERGENCY MANAGEMENT AGENCY

School Earthquake Safety & Education Program

Publications

FEMA 241 Identification and Reduction of Nonstructural Earthquake Hazards in Schools

This is one of several illustrated guides depicting ways to reduce or eliminate risks from earthquake damage to equipment, furnishings, and unsecured objects.

FEMA 220 School Intervention Following a Critical Incident

This 20-page booklet presents a broad overview on how a school might work with mental health professionals to put together a *Crisis Counseling Program* for the entire school community.

FEMA 219 How to Help Children After a Disaster

A team of educators and child mental health professionals developed this 17-page guidebook for teachers. It includes several classroom activities using drawing and talking methods to help children cope with the disaster.

FEMA 159 EARTHQUAKES - A Teacher's Package for K-6 Grades

Also known as *Tremor Troop*, this 280-page package was developed by the National Science Teachers Association. It contains hands-on classroom activities that support virtually all elementary subject areas. Designed for the classroom teacher with little or no background in earth science, the six-unit package focuses on:

- Defining an earthquake,
- Why and where earthquakes occur,
- Physical results of earthquakes,
- Measuring earthquakes
- Recognizing an earthquake, and
- Earthquake safety and survival.

The **Teacher's Package** is divided into three grade levels and includes Background, Earthquake Legends, Scope and Sequence Charts, and Line Masters.

FEMA 149 Seismic Considerations: Elementary and Secondary Schools

This 102-page (including appendices) guidebook was prepared by the Building Seismic Safety Council. It presents the cost and benefits of applying seismic design in the construction of new school facilities. It also explains how school buildings are damaged by earthquakes, and how damage occurs to nonstructural components and building contents.

FEMA 88 Guidebook for Developing A School Earthquake Safety Program

This 50-page guide is designed to assist the school community of principal, teachers, staff, students, and parents develop and tailor an earthquake safety program for their school.

The guide takes a step-by-step approach to:

- Identify potential earthquake hazards,
- Prepare and conduct earthquake drills,
- Plan for immediate response and care,
- Develop communication plans, and
- Plan for 72-hour shelter and care.

FEMA 88a Earthquake Safety Activities for Children

This 4-part (52-page) booklet contains excerpts from Units 5 and 6 of **EARTHQUAKES - A Teacher's Package for K-6** (FEMA 159). It provides classroom activities designed to prepare students to cope safely when an earthquake occurs. The booklet covers:

- What happens during an earthquake,
- Hazard hunts,
- Assembling emergency kits, and
- Earthquake simulation and drills.

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Videos

Children and Trauma - the School's Response [20:30 min.]

A program for mental health professionals, school administrators, and teachers; the video presents: crisis impact on children and schools, normal and prolonged stress responses, assessment considerations, and intervention models.

SCHOOLS and EARTHQUAKES - Building Schools to Withstand Earthquakes [14:27 min.]

Cost is often the overriding factor in decisions to implement seismic safety policies. This video conveys the lifesaving and economic benefits of including earthquake-resistant design in new school construction. The video complements **Seismic Considerations: Elementary and Secondary Schools (FEMA 149).**

CRITICAL TIME - Earthquake Response Planning & Schools [14:00 min]

This video discusses the responsiblities of school administrators, teachers, and staff to acquire the knowledge and skills needed to protect and care for the student population until outside help is available. The video complements the **Guidebook for Developing a School Earthquake Safety Program (FEMA 88).**

Reducing Nonstructural Earthquake Damage - A practical Guide for Schools [13:00 min.]

This video identifies major nonstructural hazards in school buildings, and suggests simple and inexpensive ways to reduce those hazards. The video complements **Identification and Reduction of Nonstructural Earthquake Hazards in Schools (FEMA 241).**

Distribution of publications and videos is limited to one free copy per school while supplies last. Send single copy requests on school letterhead to:

Marilyn MacCabe
Earthquake Education
Federal Emergency Management Agency
Washington, D.C. 20472
FAX: (202) 646-4228

Workshops

Train-the-Trainer Workshop
on
EARTHQUAKES - A Teacher's Package for K-6

June 19 to 23, 1995 ♦ Emmitsburg, Maryland
July 17 to 21, 1995 ♦ Emmitsburg, Maryland

This hands-on workshop is designed to demonstrate the use and benefits of the **Teacher's Package (FEMA 159).** The workshop also includes a unit on *Crisis Intervention*, focusing on the needs of children and school personnel, and a unit on *School Earthquake Safety Planning*.

Participation at the workshop is limited to 36 educators whose functions include providing in-serve workshops to elementary teachers and/or recommending curriculum. Their titles may include: Elementary Science Coordinator, Elementary Curriculum Coordinator, Elementary Science Consultant. We also welcome Elementary Classroom Teachers and Regional Resource Center Personnel.

Train-the-Trainer
on
School Earthquake Safety Program Workshop

March 20 to 24, 1995 ♦ Emmitsburg, Maryland
August 7 to 11, 1995 ♦ Emmitsburg, Maryland

This workshop is based on the **Guidebook for Developing a School Earthquake Safety Program (FEMA 88).** Instructional topics include: Hazard Identification, Earthquake Drills, Immediate Care and Response Requirements, Psychological Responses and Needs; Communications, Sheltering, Long-Term Recovery Considerations, Hazard Mitigation Measures, and Planning.

The intended audience for this workshop includes: School District Administrators, Principals, School Board Members, District Facility and Risk Managers, School Nurses, and Teachers.

♦ ♦ ♦

For further workshop information and application, contact:
Linda K. Straka
Emergency Management Institute
16825 W. Seton Avenue
Emmitsburg, MD 21727
FAX: (301) 447-1598

ATTACHMENT C

Excerpt From New York City Case Study

October 29, 1993

Preliminary Year 2003 Master Plan

The Preliminary Year 2003 Master Plan, subtitled Ten Year Facilities Needs Assessment for the New York City Public Schools, was submitted by the Chancellor to the board on December 23,1992. Its introduction states:

" The Preliminary Year 2003 Master Plan is a facilities needs assessment that details what renovation and construction efforts will be required over the next ten years to provide a healthy, nurturing, welcoming environment for the students and staff of the New York City Public Schools. This needs assessment documents the current and future state of our school buildings by addressing the following three basic questions:

- what is the physical condition of existing facilities and what is required to bring them to a state of good repair by the year 2003?

- what are our projected capacity needs over time and how can they best be addressed so all students have seats in real classrooms and support services can function well?

- how well do our school buildings meet educational program needs, including educational related technology, and what is required to make space flexible to adapt to changing needs and technology over time?

...

This preliminary ten-year needs assessment details the results of a system-wide examination of the current and future facilities needs of the New York City Public Schools. This information is key to substantiating the level of funding required to meet all the needs of the school system over the next ten years and to providing the Members of the Board of Education with as complete a description as possible of the variety of needs of each part of the system.

...

Our data indicates that 85% of our system requires some kind of capital work with 421 buildings requiring modernization. The capital backlog (work needed to reach a state of good repair) is over $7.8 billion. Twenty eight percent of our elementary and middle schools are overcrowded as are virtually all high schools. Over the next ten years, enrollments will increase by thirty four (34) percent resulting in overcrowding in seventy two (72) of all school districts.

The total cost for the Preliminary Year 2003 Master Plan is over $24 billion, in 1992 dollars, summarized as follows:

Category I.	State of Good Repair	$ 7.8 billion
Category II.	System Expansion	$12.7 billion
Category III.	Educational Enhancements	$ 3.1 billion
Category IV.	Safety and Security	$ 305 million
Category V.	Ancillary Facilities	$ 711 million"

This preliminary master plan was to be the subject of hearings held by each Community School Board and the Central Board of Education. Inputs from these hearings was to be incorporated, as appropriate, into the Final Year 1003 Master Plan which was to be submitted to the Board by April 1, 1993.

Needs Assessment Instruments

The task force on capital financing and construction, which recommended the creation of the SCA as well as the development of a master plan and five-year capital plan found that the lack of data on the school facilities was a major problem contributing to all the rest. Since then, New York City Public Schools, under the direction of its Chief Executive for School Facilities, has been developing and using two instruments to collect data and build a data base to remedy this problem.

School Scorecard---The first instrument is known as the School Scorecard. School Scorecard is a management information system that monitors the physical appearance conditions of all school buildings on an ongoing basis. School Scorecard compares classroom conditions to those of previous years, going back to baseline data of1987-88. Using objective scales and standards, trained inspectors rate conditions in all schools twice a year. The two ratings are averaged to produce the school year scores. The information is used to identify needs, establish priorities, allocate resources, and monitor the effectiveness of maintenance initiatives over time. Scorecard generates lists of schools which rank "worst" in particular maintenance categories. These lists have been part of the Six-Month Maintenance Plan for Skilled Trades.

Scorecard focuses mainly on perceptible damage in classrooms and toilet rooms, and is more a measure of conditions experienced by students and staff than it is an assessment of the architectural integrity or mechanical systems of the buildings. All accessible classrooms are inspected, except that in schools with over 100 classrooms, a 100-room random sample is inspected and rated.

Scorecard uses a seven-point scale from zero to six, with 0 representing virtually no damage, and 6 indicating extreme damage. Scale points are assigned by the inspectors to each of the following attributes: For walls---material integrity, paint condition, and dirt/grime; for ceilings—material integrity and paint condition. The ratings for these five attributes are averaged to arrive at an overall appearance rating. Inspectors also evaluate the following classroom fixtures: lights, floors, furniture, storage items, door operation, door appearance, window shades, window panes and chalkboards. In student toilets the following items are evaluated: sinks, urinals, water closets, stall dirt/grime and the presence of stall doors, soap, toilet paper and paper towels.

The schools with the worst overall appearance ratings are referred to as the "Schools Most In Need." Most of these schools currently have capital renovation projects in progress.

Automated Building Condition (ABC) Survey—The second instrument is known as the ABC survey. Its objective is to evaluate each school in a consistent manner, so as to allow the Office of Strategic Planning to select schools for the five-year capital plan. A full time staff of 25 is engaged in implementing the ABC.

The survey approach is to visit and survey each school with the assistance of the custodian and the school staff. The 4-person survey teams consist of two architectural inspectors, one mechanical inspector and one electrical inspector. The architectural inspectors split up with one starting on the exterior elements and the other on the interior elements. The mechanical and electrical inspectors work independently of the architectural inspectors. All elevators and escalators are surveyed separately by an elevator inspector.

The evaluation is based on breaking down the school into smaller components and rating them. Various components a weighted to arrive at an overall rating for the school. The scope of the survey is as follows:

- 15% of all classrooms or a minimum of 10.
- All public assembly areas (gyms, auditoriums and lunchrooms).
- One special use room in each category (library, shops, labs and music).
- All attic spaces.
- 50% of toilets.
- 50% of the stairwells.
- Entire basement/cellar area.
- All exterior components, including playyards.

A computerized survey form is developed for each component which identify specific items to be evaluated. Each item is rated using a five-point scale from 1 (inoperative) to 5 (excellent). These ratings are used to indicate the amount of repair required to bring the item to a state of good repair:

- 1-inoperative: total replacement.
- 2-poor: 50% repair/replacement.
- 3-fair: 20% repair/replacement.
- 4-completely serviceable: minor repairs.
- 5-very good/excellent: operating as designed with no deficiency, and age is within item's useful life.

Observed hazardous conditions and potential violations are noted, and subject to special processing.

Each school survey begins with an interview with the principal to obtain information on top facility priorities and on the presence of any art in the school. An interview with the custodian is intended to obtain information on problem areas in the building. A history of previous repairs and replacements is documented.

After each survey is completed in the field, it is reviewed and entered into the ABC System. This allows the survey data to be manipulated into various types of reporting levels from individual schools to citywide comparisons. Ultimately it develops the Board of Education Master Plan, the Five-Year Capital Plan and Annual Lump Sum Work Plans.

The annual structural inspections mandated by recent state legislation and mentioned earlier are reportedly being integrated into the ABC survey.

The ABC System was used to develop the portion of the Preliminary Year 2003 Master Plan addressing existing facilities needs by identifying modernizations, system replacements and building replacements.

Modernization needs were identified in one of three categories: Exterior, Interior and Full modernization. The ABC ratings of the following elements were examined:

Exterior	Interior
roofs	boilers
windows	plumbing
masonry	electrical systems
parapets	heating/ventilation
	temperature control

If three elements in either category were rated less than or equal to 3.5, that school was identified for an interior or exterior modernization. If a school qualified for both, it was put into the full modernization category.

For all other buildings not requiring modernization, individual system replacement needs were identified using the same methodology with the following categories of elements:

roofs	flooring
parapets	paved areas - blacktop
exterior masonry	paved areas - concrete
windows	playground redevelopment
electrical systems	fencing
heating plant upgrade	boiler conversion
HVAC	climate control
piping/plumbing	low voltage electrical
student toilets	intrusion prevention
staff toilets	elevators

Building replacements were identified by averaging the interior and exterior overall ratings and by the age of the buildings. All buildings with a combined overall rating of less than 3 which did not have landmark status and were built before 1920 were identified as needing replacement.

ATTACHMENT D

Excerpt From Seattle Case Study

November 2, 1993

V. CAPITAL IMPROVEMENT AND MAINTENANCE PRACTICES

Following is a chronology of Seattle Public Schools capital improvements and maintenance, as related to seismic issues:

1949

Ten schools were reportedly damaged in the 1949 earthquake and were later demolished. Two of these were in Seattle. Other Seattle schools were damaged (facades, cornices and chimneys). There were no related injuries because schools were not in session when the earthquake occurred.

In addition to the demolitions, the damage triggered some seismic rehab work in the early 1950s. This reportedly consisted of tiebacks of masonry facade elements to the wood structures.

The earthquake also led to a change in Seattle's parapet ordinance.

1965

The 1965 earthquake triggered code changes in Seattle, but did not result in seismic work on Seattle schools for at least ten years. (This is inconsistent with the references to some gable and other repairs following 1965, which are found in the 1977 Seismic Survey of 22 Seattle Schools discussed below.) Little retrofit work was done in general in Seattle schools between 1960 and 1970.

1977-1979

Seattle school district planning efforts in the late 1970s and into the early 1980s were related to school closings due to declining enrollment and excess space. However, decisions related to the closing and/or demolition of older schools must be taken in the context of a strong landmark ordinance, and the fact that many older schools are designated as historic landmarks.

A Facilities Utilization Study reportedly identified Hawthorne Elementary and four other schools as "imminent hazards", and led to the Seismic Survey of 22 Seattle Schools, dated November 30, 1977. Three engineering firms conducted "limited observations of structural elements and a brief design review" of buildings which for the most part consisted of load bearing masonry walls and wood floors and roofs. The engineers recommended three levels of work:

- Imminent hazards consisting mostly of parapets, gables, chimneys, and loose or poorly anchored masonry.
- Limited floor and roof ties, diaphragm reinforcement, and added shear walls.
- "Present code requirements".

Cost estimates were also included.

This was followed by the Seismic Survey of 10 Schools and Chimneys at 53 Schools, dated September 6, 1978. (This report referred to "seismic corrections to 19 schools, currently concluding"—presumably 19 of the 22 previously surveyed.) The 10 schools were inspected, consisting of load bearing masonry walls and reinforced concrete floors (9 schools) or wood floors (one school). Information on the chimneys at 53 schools was obtained by a questionnaire. The engineers recommended work to remove the imminent hazards. Cost estimates were included ($460,000 for the schools, over $40,000 for the chimneys).

This in turn was followed by Seismic Inspections, 87 Schools, dated August 10, 1979. The survey was carried out by a District Building Inspector and a Brick Mason of the Maintenance Section. The survey found that 50 schools required no seismic work, 12 required "some attention to skylights only", and 25 have problems which "may be considered as 'grave risk hazards'." For the latter work items were identified, but costs were not estimated. The report concluded that "with adequate funding, specifications can be prepared and work completed by the start of the 1980-81 school year."

With these three surveys the imminent seismic hazards in all Seattle schools were identified.

1983

A long range plan was approved by the Board in 1981, which covered the period 1981-1990. This included a two-tiered approach to capital improvements:

- Repairs and major maintenance, funded by Capital Levy Bonds (see below).
- Replacement or modernization of hazardous buildings, funded by Capital Improvement Bonds (CIP-1), which started in 1984.

In carrying out the plan, the District commissioned CMB/KIM Architects & Engineers to carry out a comprehensive survey of all Seattle schools. The study was initiated in December of 1982. A preliminary report consisting of three volumes and entitled Comprehensive Survey of Educational Facilities, Seattle School District No.1 was published on April 8, 1983. The study consisted of two basic parts:

- An inventory and categorization of deficiencies.
- A seismic analysis of every building.

The deficiency inventory was based on a field inspection of each site by a minimum of five professionals, including an architect, a structural engineer, a mechanical and electrical engineer, and a certified roofing inspector. Approximately 50 man-hours were spent at each site. Approximately 6,000 deficiencies were documented at 101 sites. Deficiencies were prioritized in terms of levels of risk, impact of non-action and related by level of condition. The useful life of each recorded defi-

ciency was established. Hazardous conditions were processed under special procedures, and received immediate attention by the District.

The seismic analysis for each facility consisted of seven parts:

- Field inspection and evaluation.
- Immediate reporting of major deficiencies.
- Computation of ratings in terms of structural and nonstructural quality.
- Establishment of probabilities of occurrence for major earthquakes.
- Determination of possible site-dependent amplification due to poor soil conditions.
- Computation of risks (in terms of damage and casualties).
- Comparisons with other commonly accepted risks.

The analysis utilized a rating system ranging from 0 to 100, wherein structural components of varying weights could receive up to 67 points and architectural components of varying weights could receive up to 33 points. Deficiencies in design quality and component condition could further reduce the ratings.

The analysis used damage algorithms partly based on work by Wiggins and Moran (1971) and Whitman et al (1975), and summarized by Lee and Collins (1977).

The engineers concluded that:

Based on this survey, the majority of facilities exceed an "ordinary" level of acceptable risk. These structures should be strengthened or retired as soon as monetary resources permit it. The methodology taken in this evaluation is directed towards establishing procedures and priorities to reduce the risks to acceptable levels.

The CMB/KIM preliminary report called for additional value engineering and life cycle cost analyses. While these analyses were not formally carried out, it is clear that the CMB/KIM study provided the base for the major maintenance and repairs done under the Capital Levy Program (CLP) in the 1980s (reportedly, structural improvements, with a cap of $150,000 on seismic work, were undertaken at 20 schools under the CLP program), and the Capital Improvement Program (CIP-I).

The CIP-I, approved by the voters in 1984, resulted in the modernization or replacement of 14 elementary schools and one high school between 1986 and 1991, at a cost of about $140 million (of which about $40 million were State funds). The program utilized data from the CMB/KIM report, supplemented by information developed by each project's construction manager. The seismic improvements included in each project were based on proposals by each architect-engineer team who

had been provided with the CMB/KIM data. These proposals were then negotiated with the Seattle building department, with the negotiations forming the basis for each building permit. Each school was individually negotiated.

1991

Since 1982 the District has reportedly been refining its approach to seismic rehabilitation under both the Capital Levy Program and the Capital Improvement Program. At the same time, significant changes occurred in the seismic requirements of the building code, reflecting a greater understanding of building performance in an earthquake. In order to keep pace with these changes, Seattle Public Schools undertook two related engineering studies which produced two 1991 reports referred to as the TRA and the Dodd Pacific reports.

The first study, entitled Structural Evaluation of Seattle Public Schools was produced by TRA Architecture Engineering Planning Interiors of Seattle, and published in early 1991. This was a structural evaluation of the seismic resistance of all Seattle schools constructed before 1968, and was viewed as an "augmentative update" of the seismic portion of the 1982 CMB/KIM report. The goal of the study was

"...to establish a minimum standard for seismic upgrade of all existing schools and to rate the schools relative to that standard."

TRA used the "Rapid Analysis Procedure" of ATC-14, Evaluating the Seismic Resistance of Existing Buildings, first published in 1987, and the ABK methodology for unreinforced masonry buildings prepared under a grant from the National Science Foundation in 1984. The procedure is based on a survey of drawings and documents, and does not require field inspection. The ATC-14 methodology rates the structural capacity of the major seismic load resisting components, and compares them to a defined standard. A numerical rating allows the ranking of buildings. A rating of100 represents a building whose allowable shear stress and required shear stress are equal. (In order to relate the ATC-14 standard to other known standards, TRA state that an equivalent new school designed to meet the 1988 Uniform Building Code will rank above a rating of 165.) TRA applied an importance factor of 1.25 to the analysis of Seattle schools (i.e., a rating of 100 meets 125% of the ATC-14 minimum standard). TRA further point out that

"A rating of 100 or greater does not necessarily indicate that no remedial work will be needed. What it does indicate is that the building contains adequate structural elements to meet the standard. Other structural issues that are not directly addressed in the study are the adequacy of internal structural connections and non-structural elements."

The ratings for Seattle schools ranged from 20 to 750, for 166 separately identified buildings (i.e., several buildings per school). Eighty-six buildings (50 schools) rated below 100. TRA tabulated the CMB/KIM seismic ratings together with the ATC-14 ratings. There does not appear to be a direct correlation between the two rating methods.

The 50 schools with ratings below 100 were subjected to further structural analysis by Dodd Pacific Engineering, Inc. of Seattle and San Francisco. The analysis was based on a review of drawings, and without site visits. Dodd Pacific utilized the results of their analysis to prepare general recommendations for seismic upgrades of the major seismic load resisting components. In addition they prepared recommendations for the repair of major nonstructural deficiencies such as unreinforced masonry chimneys and parapets in each building. Each building was assigned a priority ranking from 1 to 7 (1 being best) to assist the non-technical users of the study. Finally, preliminary construction cost estimates to implement the recommended seismic upgrades were prepared for each building. The results of the analysis were published in early 1991 in a document entitled Abbreviated ATC-14 and ABK Seismic Evaluations, and Preliminary Construction Cost Estimates.

1992

In January and February 1992 Seattle Public Schools published two related reports designated "Creating The Space To Learn — Superintendent's Preliminary Recommendations." The first is a "Proposed Facilities Master Plan 1992 to 2010", and the second is a "Proposed Phase II Capital Improvement Program". Following extensive public review, these documents were revised and adopted by the Board of Directors, and published on July 15, 1992 as "Superintendent's Final Recommendations — 2010 Facilities Master Plan and Capital Improvement Program Phase II."

The plan states that "the years of enrollment decline and school closures appear to be over...By 2010, close to 57,000...students will be attending Seattle Public Schools. This number represents an almost 30% jump from today's present enrollment..." It continues:

"While educators, students and parents wrestle with the educational challenges of the next century, the facilities that house and support our educational programs will also have to be transformed. More than a third of Seattle schools are already 60 years or older. Many are in poor condition and have outdated electrical, heating and ventilating systems. **Forty percent still need significant work to improve resistance to earthquakes.** Many lack the space and technology needed to educate today's students to be successful in tomorrow's competitive world." (Emphasis added)

The Board adopted 11 facilities goals for the District, of which two are especially relevant to this study. Goal 3 states:

"Assure that buildings meet health and safety standards with regard to seismic, fire, lighting, etc."

Goal 8 states:

"Provide safe, secure and efficient buildings from which essential and vital operations can be continued if a disaster occurs."

The planned Capital Improvement Program Phase II (CIP-II), covering the period 1992-2000, includes the modernization, preservation orreplacement of 25 elementary schools, two middle schools, five high schools and six alternative/special schools. The estimated cost of CIP-II is $795 million. $695 million would be obtained through a 15-year bond measure (rejected by the voters twice, in

September and November 1992). Approximately $100 million would be supplemented from other sources such as interest earnings, state matching funds and possible future development impact fees. Capital Levy funds would continue to be made available for schools not included in CIP-II, but in need of seismic and other building improvements.

The Board adopted six criteria for CIP-II selection and order of projects. In order of importance (percentages provided by Board staff), these are:

1. Completion of projects left over from CIP-I.
2. **Seismic conditions** (30%).
3. Conditions of structures' physical systems (25%).
4. Adequacy for educational uses (20%).
5. Need for increased capacity to meet projected student population and desegregation goals (15%).
6. Age (10%).

(Emphasis added)

The rating system of seismic condition was based on the ATC-14 rating (TRA), the Dodd Pacific priority ranking, and the seismic upgrade cost estimates (Dodd Pacific amended).

Following the defeat of the $695 million bond at the polls in 1992, which was reportedly attributable to a lack of project specificity and lack of support of the preservation community, CIP-II was scaled back by pushing its end date from the year 2000 to 2005. An initial bond issue of $339 million has been authorized by the School Board. CIP-II project criteria have not changed.

A Seismic Action Plan was developed by District staff in parallel with the 2010 Facility Master Plan and CIP-II. The Seismic Action Plan is viewed as the culmination of all the previous structural evaluations and studies (reported above). Scheduling of seismic work in the plan is based on the "worst first" concept, i.e., schools with lower seismic ratings are to be upgraded first. Capital Levy Program (CLP) work is projected for all 50 schools in the Dodd Pacific study. The Seismic Action Plan makes thefollowing assumptions regarding the relationship of work under CLP and CIP-II. (It should be noted that CLP and CIP projects are administered separately within the Seattle Public Schools organizational structure):

- CLP upgrades on CIP-II schools will be completed only if there is a two-year interval between CIP-II construction and CLP work.
- CLP upgrades on CIP-II schools will be limited to a maximum dollar amount of $200,000 per year for all CLP work.
- CLP upgrades on non CIP-II schools will be included with other CLP renovations.

ATTACHMENT E

Excerpt From Portland Case Study

April 8, 1994

V. CAPITAL IMPROVEMENT AND MAINTENANCE PRACTICES

General

In 1976 Portland Public Schools undertook the task of reducing a deferred maintenance backlog that had grown to significant proportion. (In 1984 deferred maintenance was estimated at $200 million.) Special Maintenance and Renovation Funds (065, 067 and 068) were established to address the most critical maintenance deficiencies along with considerable expansion and remodeling.

Since 1983 they have spent about $100 million on capital improvements (see next section on how this was financed), in a sequence of two-year strategic capital improvement plans. Of this, 75% was spent on "expansion/adjustment", and 25% on "capital renewal" (reducing the maintenance backlog). As of this writing these funds have been spent in full and there is no current pool of funds for capital improvements.

The Superintendent has directed that the strategic capital improvement plans be extended to five years, starting with FY 1991-92. This planning process, the Plan Facility Management Program, is currently underway. It initially consisted of three parts, or phases:

- Phase I - Maintenance Audit - Dated September 1991, this plan covers "capital renewal" work based on facility condition inspections, and projects the expenditure of $33,164,207 over the five years, which is about double the annual spending in the previous eight years. The plan is based on a life-cycle replacement schedule. The source of funds for this Phase is about $2 million annually of maintenance funds, and $3-4 million of capital funds. A more recent draft entitled Capital Program Requirements dated October 1992 projected the seven-year capital needs for "capital renewal" at $49.4 million.

- Phase II - Energy Audit - Dated February 1992, this plan established a goal of reducing annual energy cost by 30% overan eight year period. It establishes an Energy Management Program projected at about $13 million ($1.2 million for energy study and design, about $450,000 for operation and maintenance cost, and nearly $11.4 million for energy conservation measures). The draft Capital Program Requirements dated October 1992 revised the seven-year capital needs for energy management to $24.8 million. A recent program of the State Energy Office and the utility company has made a low interest $20 million line of credit available to Portland Public Schools for upgrading of the energy performance in buildings.

- Phase III - Adaptability Audit - The plan for this Phase is under development, but has not been published as a Phase III summary document. It consists of a Code Compliance Program (including ADA, fire and life safety, seismic, etc.), an Environmental Program (asbestos, lead, radon, etc.) and a Safety/Risk Management Program. The

draft Capital Program Requirements dated October 1992 project the seven year capital needs as follows:

Code Compliance—$19.2 million
Environmental——$ 6.5 "
Safety/Risk——$ 1.3 "

Within Code Compliance, current projections are about 30% each for ADA, fire & life safety and seismic, with 10% for the rest.

This Plan Facility Management Program does not include an additional $42.7 of capital funds over seven years currently estimated for enrollment expansion, and an additional $6 million estimated for minor building improvement and minor capital equipment.

The Portland Public Schools Risk Manager works closely with the Physical Plant Division in developing the safety budgets within the facilities budgets with the goal of reducing risks. This collaboration could be extended to the reduction of earthquake risks.

Typical costs incurred or projected have been as follows:

Renovation ———— $70/sq.ft. (of area affected)
Maintenance (Capital Renewal) — $.5/sq.ft./yr (all bldgs)
Energy Conservation ———— $.16/sq.ft./yr (all bldgs)
———— $1.3/sq.ft. total program
Reroofing —— $60-100/square ($.3-.4/sq.ft. floor area)
Asbestos Abatement ———— $.06/sq.ft./yr (all bldgs)
———— $4/sq.ft. total program

Seismic

Seismic improvement is included within the Code Compliance Program, of which it currently comprises about 30%. The program will entail a seismic analysis of buildings, which will be initiated when DOGAMI's geologic survey is available. The seismic analysis will not require any special budget authority if it can be accomplished within the Physical Plant Division's budget. (The Director has the authority to reallocate funds within his budget.)

Seismic safety is described in the draft Capital Program Requirements dated October 1992 s follows:

"With the recent change in the seismic zone for western Oregon, the Portland Bureau of Buildings will be requiring structural modifications to buildings that undergo remodeling. [Ed.: Note that this has not yet occurred.] Proactively, the implementation of a program integrated with routine maintenance activity to mitigate non-structural and structural seismic concerns will be initiated in all District facilities. This program will not, however, upgrade all facilities to current design standards for earthquake resistance."

The seismic strengthening of non-structural elements currently planned includes parapets, lateral bracing of ceiling systems, large glazing areas and high shelves. These non-structural seismic retrofit measures have been estimated at $3/sq.ft.

Seismic improvement received a boost from the earthquake of March 1993. Following the earthquake every building was examined by custodial staff and observed damage was reported. Thirty percent of the schools were inspected by Physical Plant personnel as a result of these reports. Most of the damage was determined to be superficial, but two closures weredirectly attributable to earthquake damage in an auditorium and walkways. The latter were in a precast concrete building which current plans will demolish.

Additionally, an archival plans analysis of all the schools was undertaken to identify all load bearing unreinforced masonry buildings. This information was combined with a review and update of the facility condition inspections carried out in late 1991, and summarized in a Facility Profile Summary dated May 1993. In addition to basic data about each school, four "condition rating criteria" were included:

- Code Upgrade Status
- ADA
- Deferred Maintenance
- Seismic Condition (very poor, poor, fair, good)

ATTACHMENT F

Excerpt From Portland Case Study

April 8, 1994

IV. REGULATORY BACKGROUND (CONTEXT)

State - In Oregon the State promulgates the building code, and enforces it in those jurisdictions (cities and counties) which opt not to enforce the code. The State is also responsible for the elevator and boiler codes. Finally, the State tests and certifies local building officials, for which it collects a 5% surcharge on all permit fees.

The building code promulgated by the State is the Uniform Building Code (UBC). They have recently adopted the 1991 edition, including a change to place western Oregon in Seismic Zone 3. Some owners in Portland were reportedly building to Zone3 requirements voluntarily even before the change.

Portland - The city of Portland has code enforcement jurisdiction over Portland Public Schools.

In enforcing the seismic provisions of the code, the City of Portland Bureau of Buildings evaluates the plans and reviews the calculations. In the case of a change of use in an existing building the Bureau of Buildings requires compliance with the code requirements for new construction, and when this is impractical they require an evaluation using a force analysis per the current code, and try to achieve "equivalent life safety". The case is then referred to the Structural Advisory Committee which makes a recommendation to the Bureau of Buildings. Unreinforced masonry walls are accepted for shear on the basis of tests.

In the case of a rehabilitation of an existing building the Bureau of Buildings "try to persuade the owner to hire an engineer to perform a seismic evaluation of the building." They have recently started using the seismic provisions of the Uniform Code for Building Conservation (UCBC) as a guideline in dealing with several buildings.

Chapter 24.55 of the Code of the City of Portland, Abatement of Unsafe, Abandoned and Dangerous Buildings (the "Hazardous Building Code"), is used in Portland as a tool for achieving, among other things, incremental improvements in existing buildings. The objective is to develop a programwhich leads to investment in existing buildings as a function of risk, rather than having such investment governed by arbitrary code triggers. The approach reportedly takes the economics of the situation into account by phasing the upgrade work. This is accomplished by means of a formal agreement of phased improvements making use of a series of renewable Temporary Certificates of Occupancy. The method has been used to accomplish a variety of life safety, accessibility and seismic improvements in Portland buildings. (We have obtained an example of an Agreement signed in January 1990 to achieve seismic strengthening of an unreinforced masonry building in four phases over a two-year period.) The Bureau of Buildings has entered into this type of agreement with Portland Public Schools to address life safety and accessibility issues, but it has not so far addressed seismic issues in schools.

One of the main issues in adopting the Zone 3 code change in Portland was that Chapter 24.55 includes a definition of "dangerous structure" as the lack of capacity to resist a minimum percentage of the forces defined in the building code. By this definition most buildings built to Zone 2B requirements are "dangerous" in Zone 3.

Following the March 25, 1993 northwest Oregon earthquake several draft proposals for seismic regulations for existing buildings have been circulated. A Seismic Task Force is reportedly about to be named to develop such regulations.

Finally, the Bureau of Fire, Rescue and Emergency Services has reportedly completed a seismic survey of Portland fire stations and other critical structures (at a cost of $30,000), and the Bureau of Buildings has recently completed a survey (employing students) of 3,000 unreinforced masonry buildings, most of them located in downtown Portland.

ATTACHMENT G

Excerpt From Ogden Case Study

April 29, 1993

The State of Utah Division of Risk Management in the Department of Administrative Services maintains and manages a risk pool covering the public schools. The school districts are assessed contributions to the pool, and the Division of Risk Management self insures a relatively high deductible and purchase insurance for losses in excess of the deductible. The Division of Risk Management is becoming increasingly involved in facility-related risk management of Utah's schools, including encouraging adoption of loss reduction measures by local districts.

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As noted earlier, the State Division of Risk Management is becoming increasingly involved in facility-related risk management of Utah's schools. The division has increased its staff significantly in the past 18 months, including the addition of a professional engineer. It has initiated two types of inspection programs--self-inspection and division inspection:

- The self-inspection program occurs in state buildings, colleges and schools. It covers a variety of non-structural hazards including seismic hazards. The achievement of "substantial" corrections results in a credit on the required insurance pool contribution. The intention is to initiate surveys next year of unreinforced masonry buildings and older buildings constructed prior to the adoption of building codes.

- State Division of Risk Management inspections are carried out by four inspectors who spend all their time in the field. Each elementary school in the state is reportedly visited by an inspector every 2-3 years. The inspections may result in recommendations which could affect insurance coverage.

While neither of these programs is strictly related to code enforcement, they may lead to incremental seismic retrofit of schools by encouraging the adoption of loss reduction measures by local districts.